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BUYING VS. RENTING A HOME – A STOCK MARKET INVESTORS' VIEWPOINT

Master's Thesis
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Abstract of master's thesis

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Abstract

The decision to buy or not to buy a home is typically one of the most important financial decisions an individual or a household faces during the course of their life. When the alternative to buying is renting a home instead, it becomes necessary to examine the financial implications and viability of selecting either of these options. Buying a home comes with an opportunity cost when compared with renting, as owner-occupied housing typically has higher monthly costs than renting when a mortgage is used to finance the home purchase and while the mortgage is not yet fully paid off.

This thesis examines the question of whether one should buy or rent their home in Finland when it is assumed that the cost difference between buying and owning versus renting a home, i.e. the opportunity cost of buying a home, is invested into the stock market. The topic is approached by constructing a mathematical decision-making model that can be used to calculate the amount of money an individual would be left with after a holding period if they chose to rent or buy their home in a given scenario. Then, a historical scenario analysis using the earlier built model is presented, using data from Statistics Finland and other sources to determine whether renting or buying a home would have been the optimal choice in a number of different situations. Finally, a risk analysis is done, using selected metrics to evaluate and compare the riskiness of buying and owning a home versus renting and investing in the stock market instead.

The scenario analysis done with empirical data showed that buying a home has been the financially better choice in all of the examined scenarios in Finland. Additionally, buying a home was shown to be a less risky investment than stocks, a result that also favors the homebuyer over the renter. However, it was notable that the relative advantage homeownership had over renting in monetary terms was smaller when the examined time period was shorter, a result that is consistent with previous research around this topic. Thus, it is possible that renting could be the better tenure choice if the considered time period was short enough. Finally, even though homeownership had been the better choice over renting in all of the examined scenarios, home prices are currently declining in many areas around Finland, and therefore buying a home may not be a great long-term investment in these locations in the future anymore.

Keywords buying, renting, homeownership, tenure choice, stocks, scenario analysis

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Tiivistelmä

Päätös siitä, ostaako asunto vai ei, on tyypillisesti yksi tärkeimmistä taloudellisista päätöksistä kotitalouksien ja yksilöiden tasolla. Kun vaihtoehtona on joko ostaa tai vuokrata asunto, on tarpeellista tutkia näiden vaihtoehtojen taloudellisia vaikutuksia ja järkevyyttä. Asunnon ostamiseen liittyy vaihtoehtoiskustannus vuokraamiseen verrattuna, koska omistusasumisen kuukausikulut ovat tyypillisesti vuokra-asumista korkeammat, mikäli asunnon oston rahoituksessa on käytetty asuntolainaa, jota ei ole vielä kokonaan maksettu pois.

Tämä tutkimus tarkastelee kysymystä siitä, onko järkevintä ostaa vai vuokrata asunto Suomessa, kun oletetaan, että omistusasumisen vaihtoehtoiskustannus sijoitetaan vuokra-asumisen tapauksessa osakemarkkinoille. Aihetta lähestyttiin rakentamalla matemaattinen päätöksenteon malli, jolla voidaan laskea varallisuuden määrä, joka yksilölle tai kotitaloudelle kertyisi tietyn tarkastelujakson päätteeksi, jos asunto päätettäisiin ostaa/vuokrata tietyssä tilanteessa. Tämän jälkeen esitellään rakennetun mallin pohjalta historialliseen dataan perustuva analyysi, jossa on tutkittu, olisiko omistus- vai vuokra-asuminen ollut kannattavampi vaihtoehto erilaisissa tutkimusta varten valituissa tilanteissa. Lopuksi tarkastellaan lisäksi tiettyjen mittarien kautta asunnon oston ja omistusasumisen riskisyyttä verrattuna vuokra-asumiseen ja osakesijoittamiseen.

Historiallisen datan pohjalta tehty empiirinen analyysi osoitti, että asunnon osto ja omistusasuminen on ollut vuokra-asumista taloudellisesti kannattavampi vaihtoehto kaikissa tutkituissa tilanteissa Suomessa. Lisäksi omistusasunnon todettiin olevan osakkeisiin verrattuna pienemmän riskin sijoituskohde, mikä myös puoltaa omistusasumista vuokra-asumisen ja osakesijoittamisen sijaan. Omistusasujan saama taloudellinen hyöty vuokra-asujaan verrattuna oli kuitenkin sitä pienempi, mitä lyhyempi oli tarkasteltu ajanjakso. Tämä tulos on linjassa aikaisempien aiheesta tehtyjen tutkimusten kanssa. On siis mahdollista, että vuokra-asuminen voisi olla omistusasumista parempi vaihtoehto, jos tarkasteltava aikaväli olisi tarpeeksi lyhyt. On myös huomattava, että vaikka omistusasuminen todettiin vuokra-asumista paremmaksi vaihtoehdoksi kaikissa tutkituissa tilanteissa, laskevat asuntojen hinnat tällä hetkellä monella alueella Suomessa, joten asunnon osto tällaisella alueella ei välttämättä ole kuitenkaan hyvä pitkän aikavälin sijoitus.

Avainsanat asunnon osto, vuokraus, omistusasuminen, asumismuoto, osakkeet, skenaarioanalyysi

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1 Introduction

1.1 Motivation

We all need some type of a home to live in. This brings us to a situation where different housing options need to be examined. The housing market offers two main options for individuals looking to obtain housing services: buying or renting a home. Assuming an individual who has the resources required to choose between these two options (i.e. they can choose to either rent or to buy a home), the question of whether the individual should buy their own home, or choose to rent instead is of great importance. This is because the purchase of a home is typically one of the most important financial decisions a person makes during their lifetime, and it is a decision that can potentially have a serious impact on their future wealth and financial wellbeing. Honkkila (2015) notes that in 2013, 56% of all the wealth of Finnish households was in homes, such as apartments and houses. This statistic alone confirms that the choice between buying or not buying a home can have a significant impact on an individual's wealth structure.

Buying a home and then living in that owner-occupied home does not necessarily have the same cost structure, or even the same monetary costs attached to it as renting a home does. Due to this, the cost difference between buying one's home and living in an owner-occupied dwelling thereafter, can be compared with the cost of renting. The difference in costs between these two options can be called the opportunity cost of buying a home. In other words, the opportunity cost is the amount of money spent on buying a home and living in an owner-occupied home, from which the alternative cost of renting has been subtracted. If the opportunity cost is positive, buying one's own home causes more monthly expenses than renting.

Keeping in mind the potential opportunity cost attached to buying a home, we can attach another angle to the situation. If we assume that an individual has the financial resources required to freely choose between buying or renting a home, how does the situation change if it is assumed that renting means the individual will invest the opportunity cost, i.e. the cost difference between owning and renting, into the Finnish

stock market, with the goal being to maximize their financial wealth over the examined time period? Which choice, buying or renting, is now the one the individual should make?

Renting has increased in popularity in Finland over the recent years, especially among young adults aged 18-29. However, this change is not attributable to renting being viewed as a generally more attractive living method over owning, as 2/3 of young adults would prefer owner-occupied housing instead of renting their home (Aho, Myllymäki, Sandqvist & Strandell 2021). Instead, Aho et al. (2021) note that the change seems to be caused by financial reasons, i.e. buying a home is too expensive for many young adults, pushing them into the rental market instead.

Perhaps unsurprisingly, data from Statistics Finland (2019) shows that rents in Finland have been increasing steadily in recent years. However, the values of homes have been going up only in certain parts of the country, namely the Finnish capital region (the Helsinki region), as shown by data from Findikaattori (2020). This means that from the financial point of view, the question of choosing between renting and owning a home in Finland will likely have a different answer in different parts of the country. Returns from stock investments, on the other hand, are not dependent on the individual's living location or their tenure choice, but they are known to be hard to predict. For these reasons, we must conduct a scenario-based analysis of the problem based on historical data in order to get insights into which choice, buying or renting, has been the superior one during different times in different locations around the country. In addition to comparing the cost differences between buying and renting a home and living in that home thereafter, we also need to consider the profits that the individual could obtain from their stock investments, while also naturally taking into account the potential wealth generated from buying and owning a home (i.e. home price appreciation). The problem is fairly complex, and includes a multitude of variables, such as home price appreciation, the trends in rents and mortgage interest rates, as well as expected returns from investments in the stock market.

A thorough examination of this problem will be useful for anyone who looks to choose between buying or renting a home in Finland, or for an individual looking to invest a portion of their income into the Finnish stock market. Especially young adults who can afford, and who are looking to choose between buying or renting a home may use the results of this study as a guideline when making what will likely be one of the most important financial decisions in their lives.

1.2 Research questions

This study examines the question of whether one should buy or rent the home they live in in Finland, assuming they have the necessary financial resources to freely make this choice. In particular, we will look at the problem from the viewpoint of an individual or a household that wishes to invest the remaining of their income after housing costs into the Finnish stock market, looking to maximize their financial wealth over time. In the study, we will assume housing costs to be monthly occurring inevitable costs. We will also have to make assumptions about the individual's living location, and the length of time that we are examining, as these will have a significant impact on the results of the study. Furthermore, we will limit the scope of the study to Finland: this means that we will examine the research topic from the viewpoint of a person who can invest in Finnish stocks, and who has the option to either rent or buy their home in Finland.

The study aims at constructing a model which can be used to make the decision of whether one should buy or rent their home in Finland. The model should be applicable to real life situations in Finland, where the values of the model's variables can be estimated or are known beforehand. We will look at the problem from a purely financial viewpoint, meaning that the study will provide answers as to which option, buying or renting, is or has been the financially better one in a given situation. This means that, for the purpose of limiting the study's length, we will exclude all other factors and variables that could potentially impact a person's choices regarding their housing arrangements, such as the stability of their housing, threat of ejection, and the perceived value from owning a home. We will, however, also examine the risks related to different options, such as buying a home and investing in the stock market.

The research questions of the study are as follows:

1. How has the question of buying vs renting a home been studied in past literature?
2. Assuming a certain time period and location, should an individual rather have bought or rented their home in Finland, if it is assumed that they would have invested their leftover income after housing costs into the Finnish stock market?
3. Which of the two options above has been riskier?

1.3 Structure of the thesis

We will first be examining relevant literature related to our research topic. The literature review is divided into two main parts, which are both presented in chapter 2 of the thesis. The first part will examine studies related to the housing market and renting and buying a home, while giving emphasis to previous studies that have focused on presenting a comparison between the two different tenure choices. The second part, on the other hand, will focus on examining previous studies related to the stock market, with the main focus being on studies related to examining returns from stock investments. In both the first and the second part, we will also take a look at studies that have examined risks related to these topics, such as risks related to buying a home, or the risks that an individual who invests in the stock market is exposed to. This is necessary in order to better understand our research topic, and to build a framework for our own analysis presented later. Finally, the literature review also contains brief summaries on Finnish taxation related to our research topic, such as the taxation of home purchases and stock investments.

After this, in chapter 3, we will present our own empirical analysis on the research problem. This chapter will begin by constructing a decision-making model based on our research problem, which will then be applied to different historical scenarios to get insights to our main research question. Towards the end of chapter 3, we will also present a risk analysis on different options included in our research setting. This means that a risk analysis based on selected methods will be conducted to examine the riskiness of renting or buying a home and investing in stocks for a given individual applicable to our research setting.

Finally, in chapter 4, we will present a brief summary on the results of the study, as well as our own conclusions based on these results. A discussion of the study's limitations will be presented to estimate the validity and reliability of our findings. A brief note on potential future research topics related to our research problem will be given here as well.

2 Literature review

In this chapter, we will examine previous research that has been conducted and published around our research topic. The existing research can be roughly divided into two categories: the first category contains studies on the real estate market, and the second category includes studies on the stock market, particularly regarding the profits generated from stock investments.

We will first examine studies that are mostly focused on the real estate market. We will look at studies that are focused on the housing market as a whole, and then studies related to buying and renting a home. After this, we will examine existing research on the renting vs buying question, and then consult studies related to the risks of different living options. Finally, we will examine the taxation of different living options in Finland.

After examining studies that are focused on the real estate market, we will move on to studies focused on the stock market. Here, our main focus is on studies that have examined the profits generated from stock investments, including profits from the Helsinki Stock Exchange (the Finnish stock market). After this, we will also look at the risks and taxation related to stock investments in Finland, to provide a solid framework for comparing stock investments to investing in real estate, such as a home.

2.1 Renting vs buying and owning a home

2.1.1 The housing market

In order to fully understand the problem of renting vs buying, we need to first understand the housing market, which is the environment in which the problem is set. Jones & Watkins (2009) define the housing market as a market where a direct or an indirect transaction occurs between a seller and a buyer of a house. In other words, it is the market where homes exchange ownership between buyers and sellers. In this thesis, we may use

the terms “housing market” and “real estate market” when referring to the same thing, i.e. the housing market.

Housing is an important part of the economy in most countries (Kyung-Hwan 2003). The importance of it can be clearly seen from wealth statistics alone. According to Iocaviello (2011), in 2008, housing wealth (i.e. wealth bound to housing, such as homes) accounted for about a half of total household net worth in the United States. Due to the importance of the housing market for the economy and society in general, it should come as no surprise that the housing market has drawn a lot of attention over the years, and it continues to do so. Public policymakers have created many policies that affect the housing market in some way (Causa, Woloszko & Leite 2019).

Laakso & Loikkanen (2013) write that in the Helsinki region in Finland, local city governments have regulated the supply of housing to restrict the growth of the cities. They have done this, because Finnish law places strict requirements on municipalities to provide basic services, such as education and health care, to their residents, due to which the cities have had to regulate the growth of their populations, as otherwise they couldn’t meet with the growing demand for basic services (Laakso & Loikkanen 2013).

Schauman (2014) has studied the impact of housing market regulation on home prices. She notes that many countries and local governments around the world impose different types of regulation on the housing market. For instance, restrictions on building new property and the regulation of housing lot supply are common. According to Schauman (2014), reasons for this regulation may include externalities, as the housing market has an impact on society as a whole. For example, new residents in a city can impact the city both positively and negatively, as they can increase economic activity in the city, while also increasing traffic in the city, possibly leading to jammed highways etc. These externalities are positive and negative in nature, respectively, and due to this, the city government would have an incentive to control the flow of people in and out of the city. Cheshire (2012) writes that a successful regulation policy aims to maximize the positive effects created by new residents, while minimizing the negative impacts of net migration into the city.

Schauman (2014) concludes that housing market regulation increases home prices. Figure 1 shows the impact on the housing market in terms of quantity and price, when the supply of new homes is being restricted through regulatory means (Schauman 2014). The figure has been edited by adding price level P0 (price before restriction of supply).

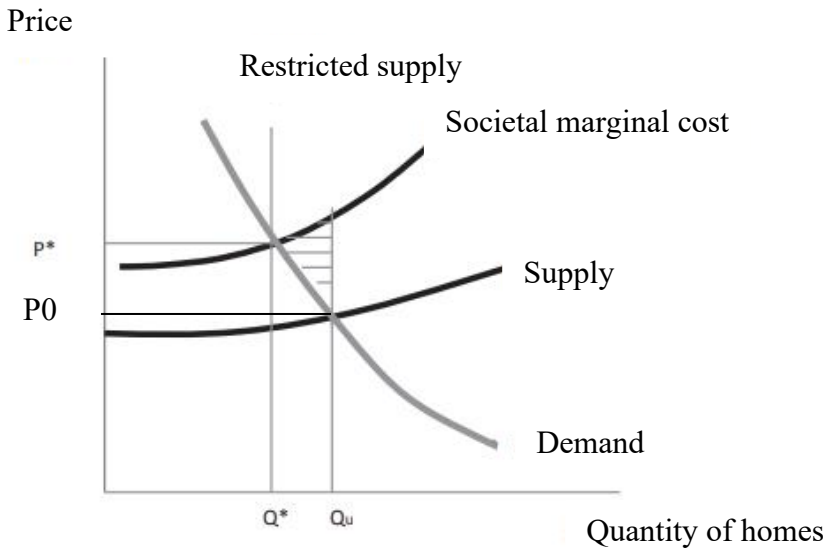

Figure 1. Impact on the housing market when the supply of new homes is restricted (Source: Schauman 2014, https://www.taloustieteellinenyhdistys.fi/wp-content/uploads/2014/09/schauman1.pdf)

The x-axis in figure 1 shows the supply of housing, while the y-axis shows the price of housing. As the supply curves moves to the left due to regulation, we can see that the supply of housing decreases ($Q^* < Q_u$), while the price of housing increases ($P^* > P0$).

To better understand the setting of this study, it is useful to have some basic understanding of the structure of the housing market in Finland. Just like in most other countries, the Finnish housing market is mostly split between owned and rented housing. Additionally, some other forms of living also exist, such as housing cooperatives (Finnish: *asumisoikeusasunto*), but these account for a much smaller percentage of the housing market and are not included in the scope of this study.

Buying and owning a home is much more popular in Finland, as opposed to renting. According to an article from Oikotie (2016), at the end of 2015, two thirds of Finnish households lived in owner-occupied housing, while the rest lived mostly in rented housing. Data from a study done by Andre & Garcia (2012) shows that the percentage of households living in owned homes in Finland seems to have increased since 2009. Below is a graph from their study showing the tenure structures in OECD countries in 2009 (Finland is highlighted).

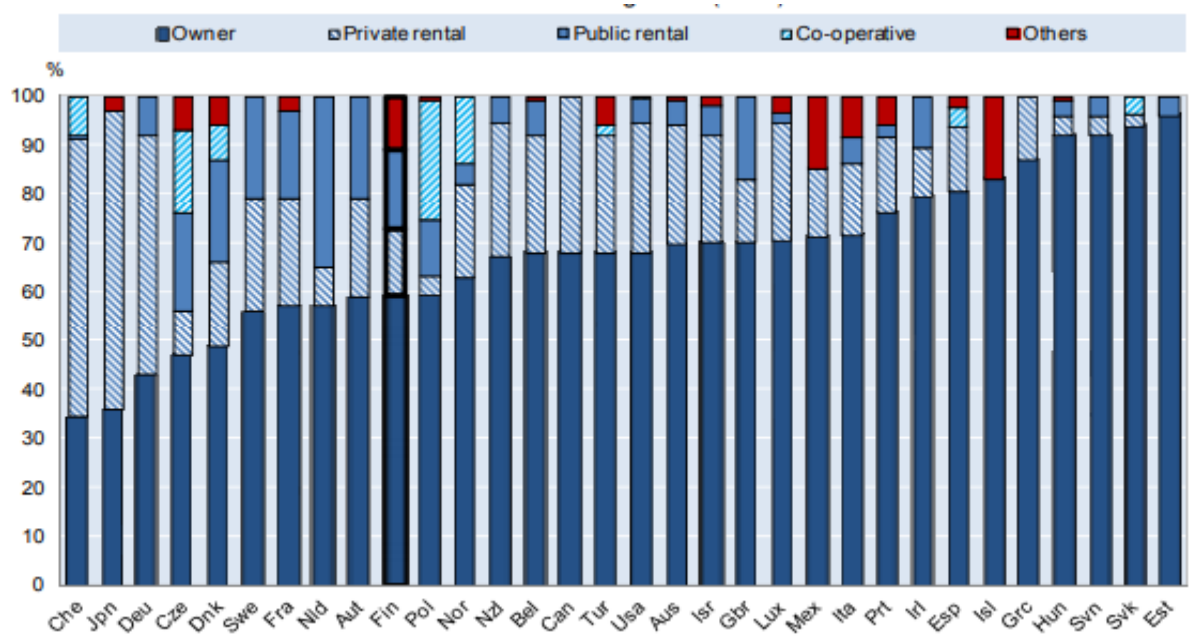

Figure 2. Tenure structure across OECD countries in 2009, per cent of dwelling stock (Source: Andre & Garcia 2012, https://www.oecd-ilibrary.org/economics/housing-price-and-investment-dynamics-in-finland_5k98rwldjr44-en)

From figure 2, we can see that while owner-occupied housing was the most preferred method of living in Finland in 2009, other options, such as private and public rental apartments were also popular. The share of people living in owner-occupied housing in Finland in 2009 was just under 60%, a lower figure than what it was by the end of 2015. Furthermore, among OECD countries, the Finnish housing market seems somewhat balanced in terms of the tenure structure, as it does not overly favor any living method, as is the case in some other countries, such as Estonia (Est), where almost all residents live in owner-occupied housing.

2.1.2 Renting a home

Renting a home refers to an arrangement where a tenant (renter) agrees to pay a certain, usually monthly, sum of money to the owner (landlord) of a property, in exchange for the right to live in and use that property. In addition to the actual rent that is paid to the landlord on a monthly basis, the tenant often also pays a one-time deposit to the landlord at the start of the rental contract. This deposit is usually equal to 1-2 months of rent in money, and it is returned to the tenant upon termination of the rental contract, provided that the

rented property is left in its original condition by the tenant and all rents have been paid to the landlord, unless otherwise agreed upon between the tenant and the landlord.

In practice, the tenant usually has the rented property in their private use while the rental contract persists. This means that the landlord's rights to access and use their property are limited while it is being rented out. For example, in Finland, the landlord can only access their rented property after obtaining permission from the tenant to do so, except under special circumstances (Suomen vuokranantajat 2019). Nevertheless, it is considered a good practice that the landlord always notifies the tenant, if the landlord is planning on visiting their rented property.

In Finland, renting a home has become more popular in recent years, especially in bigger cities, such as Helsinki and Tampere. Figure 3 from PTT (2019) shows the shares of owned and rented housing in all of Finland, as well as Helsinki and Tampere separately, from 2005 to 2017. The figure somewhat contradicts with figure 2, which may be explained by different data collection methods, or by different definitions of households.

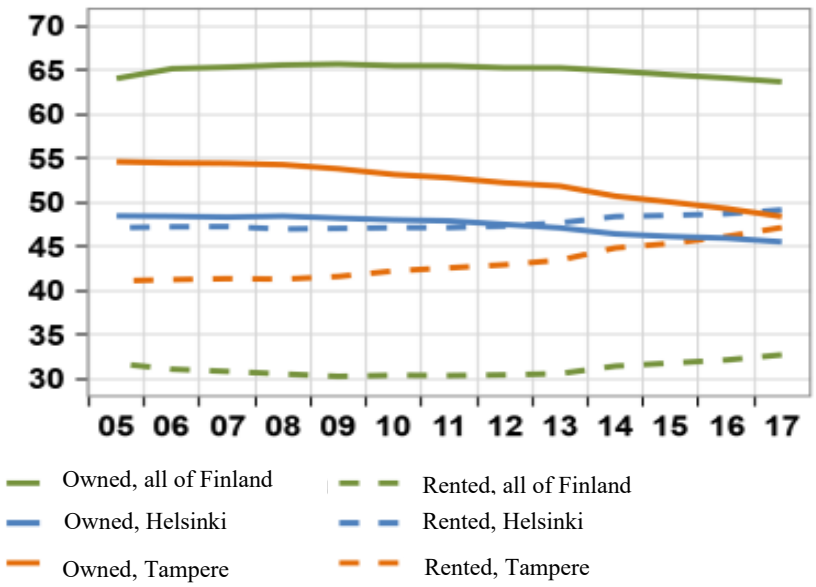

Figure 3. Shares of owned and rented housing in all of Finland, as well as Helsinki and Tampere between 2005 and 2017 (Source: PTT 2019, https://www.ptt.fi/ajankohtaista/uutiset/asuntomarkkinat-2019-erityisteema-jatkuuko-vuokra-asumisen-suosion-kasvu.html)

In Helsinki, renting has surpassed owner-occupied housing as the most common living method, as seen in figure 3. The rise in the popularity of renting homes is an internationally recognized trend that is not limited to Finland. For example, studies exist in the UK on this phenomenon that has impacted the local housing market there.

The Office for National Statistics in the UK (2019) reports that between the years 2007 and 2017, the number of households in the UK private rental sector increased from 2.8 million to 4.5 million. Additionally, younger households are more likely to rent a home: people aged 25 to 34 accounted for up to 35% of all private sector renters in the UK in 2017 (Office for National Statistics 2019). McKee, Soaita & Hoolachan (2019) use the term "Generation Rent" to describe the significant rise in the amount of young people who live in private rental housing in the UK. Their study examined the effects of living in private rental housing in the UK on the general well-being of individuals. In the study, McKee et al. (2019) conclude that the private rental sector, or PRS for short, has a negative impact on the well-being and mental health of individuals who live in the housing provided by this sector, many of whom have no other options to obtain housing. The researchers conclude that these negative effects are largely caused by renting undermining the individuals' inability to settle and take full control of the home they live in.

Hoolachan, McKee, Moore & Soaita (2016) cite papers written by Kemp (2015) and Powell (2015), writing that the increase of the UK's private rental sector since the 2007-09 global financial crisis can be attributed to factors such as increased unemployment, stricter conditions on mortgages for aspiring homeowners, as well as reforms targeted at the UK's social security system.

Korkki (2019) has studied the reasons why people choose to rent instead of buying their home in the city of Tampere in Finland. Korkki's (2019) study reveals that many recipients have chosen to rent their home due to reasons such as the ease of renting, which includes not having to worry about the upkeep of the home and not having to sell it when the tenant wants to move, as well as being able to live in a more expensive area as opposed to if they owned their home. Although some recipients in Korkki's (2019) study also reported that they did not have enough money or income to purchase a home, and thus chose to rent, but the results are nevertheless somewhat contradictory with studies from the UK, where the growth in the rental market has mostly been caused by the fact that many people cannot afford to buy a home anymore. Metsola (2016) points at the removal of regulations on the Finnish rental market in 1990 as a reason for growth in the popularity of renting in Finland. According to Statistics Finland (2014), the supply of rental homes in

Finland grew by about 66% from 1990 to 2014. Metsola (2016) attributes this growth in supply to the removal of regulations in the rental market in 1990. Basic economics state that an increase in supply should indeed increase the consumption (demand) of a good, so by this logic, the increase in the supply of rental homes in Finland could indeed be one explanation for the increased popularity of renting.

While the popularity of renting has increased in Finland, rents have been going up as well. Figure 4 shows how rents have increased in Finland in the capital region and elsewhere in the country since 2010 (Statistics Finland 2019). Their increase has been stronger than the rise in consumer prices, which is depicted in the same graph as well.

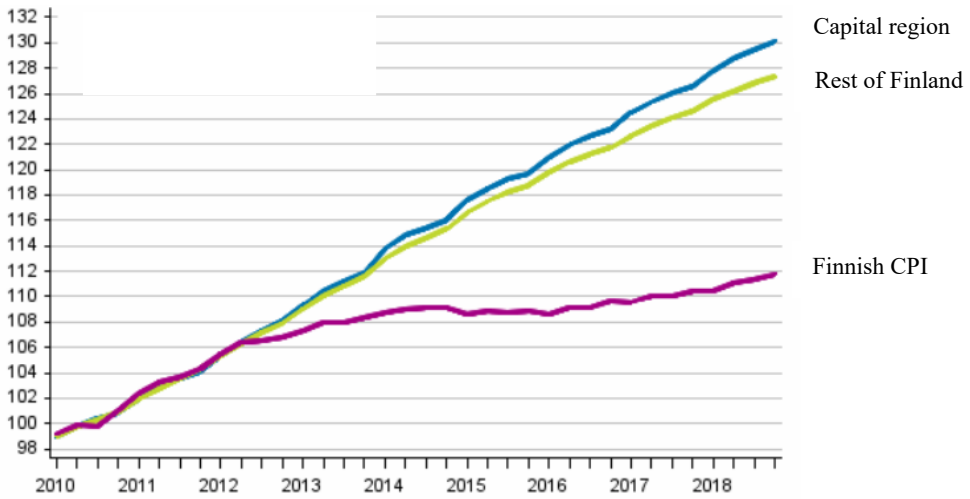

Figure 4. The trends in Finnish rents in the capital region and elsewhere in Finland, compared to the Finnish consumer price index (CPI). Indexed from 2010 (2010 = 100) (Source: Statistics Finland 2019, https://www.stat.fi/til/asvu/2018/04/asvu_2018_04_2019-02-07_tie_001_fi.html)

The reasons for the increase in rents in Finland have been attributed to many factors. Juntto, Viita, Toivonen & Koro-Kanerva (2010) point at the imbalance between demand and supply in the rental market as a driver of increasing rents. From an economical perspective, this view makes sense. However, there are also other factors that are likely driving up rents in Finland. In an article by Raeste (2018), Matti Korhonen from Statistics Finland notes that rental agreements often include a clause that ties rents to the consumer price index, with the addition that even if consumer prices do not rise, rents are still increased by a fixed amount annually. This could indeed explain why rents have been

going up steadily, even though inflation in consumer prices has slowed down since 2012, as seen in figure 4.

Another explanator for increasing rents is noted in a study done by Hiekka & Viren (2008). Their study states that the Finnish housing benefit (Finnish: *asumistuki*) has increased rents in Finland, although there is no conclusion as to how big exactly is this effect. Kangasharju (2003) has estimated that the housing benefit in Finland increases rents by about 15%. This is a significant amount, and it impacts the rental market as a whole, as this increase in rents is for all tenants, not just for those who are recipients of the housing benefit in Finland.

Nevertheless, increasing rents impact the decision of whether one should buy or rent their home. If the costs of renting increase more than the costs of buying and owning a home, the balance may shift more towards favoring owning over renting.

2.1.3 Buying a home

Buying a home and becoming a homeowner typically happens by taking a mortgage (a loan) from a bank, which is used to finance most of the home being bought. Additionally, a down payment is typically required, which will be used to pay a part of the home's price, while the rest will be covered by the mortgage. In Finland, the down payment is usually equal to 5-15% of the price of the home, while the rest 85-95% of the home's price is then paid by taking a mortgage. In addition to having the money available for a down payment, the bank that grants the mortgage may require additional securities from the homebuyer to protect the bank from credit risk.

According to Statistics Finland (2019), 63% of Finnish households lived in owner-occupied homes in 2018. This percentage had slightly decreased in the past decade, as the number was 66% in 2008. In particular, the percentage of home-owning households had decreased in the younger age groups, as can be seen in figure 5 from Statistics Finland (2019) below.

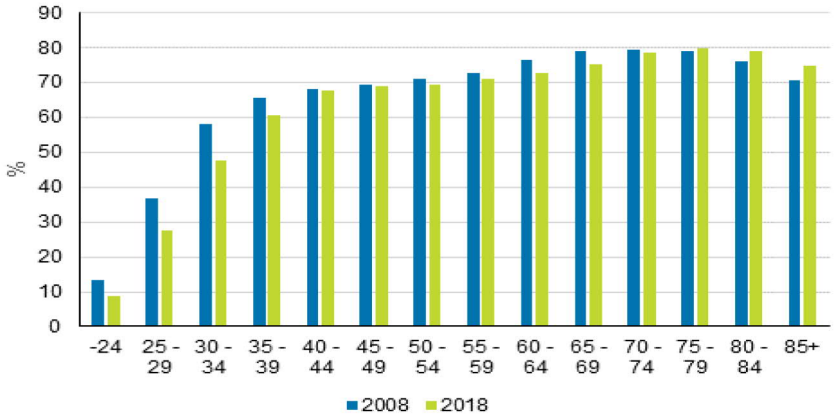

Figure 5. Percentages of Finnish households living in owner-occupied housing in 2008 vs 2018. A comparison among different age groups, where the oldest person in the household determines the household's age group (Source: Statistics Finland 2019, https://www.stat.fi/til/asas/2018/01/asas_2018_01_2019-10-10_tie_002_fi.html)

The decrease in homeownership among younger age groups in Finland goes hand in hand with the increasing popularity of renting, which was discussed in the previous chapter. Huhtinen (2019) has studied the real estate market in Helsinki, Finland, and argues that rising home prices are a key reason for why first-time homebuyers have more difficulties buying a home than before. His argument is somewhat supported by research presented earlier in this thesis, where the lack of adequate financial resources was mentioned as one of the reasons for why people choose to rent instead of buying a home.

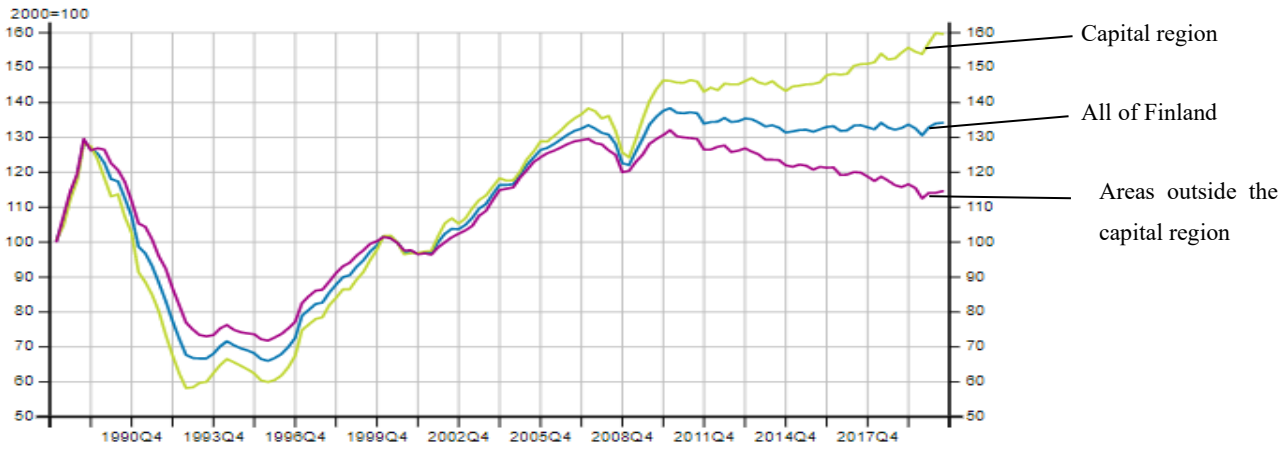

Figure 6. Home prices in Finland. Adjusted for inflation, indexed from 2000 (Source: Findikaattori 2020, https://findikaattori.fi/fi/92)

Figure 6 shows the trends in real (inflation-adjusted) Finnish home prices (Findikaattori 2020). In the graph, the year 2000 is used as the base indexing year. The

graph shows that since the 2008-2009 financial crisis induced crash, the trend in home prices has been particularly strong in the Finnish capital region, which includes Helsinki (depicted as the green line in figure 6). Based on this data, it should come as less of a surprise that the sizes of mortgages, their payback times, as well as the percentages of disposable income that are spent on mortgages in Finland have all increased as well (Hyytinen, Määttänen & Johansson 2006).

Rising home prices, increasing mortgage payback times, and the increasing percentages of income that are spent on covering the costs of mortgages are all factors that impact the buy vs rent decision. Therefore, it is important to consider why home prices have been going up in Finland, especially in the capital region. Fundamentally, the prices of homes, as with other asset classes, are determined by supply and demand, but it is important to consider what factors impact the changes in home prices.

Congjun & Yangqiu (2015) have analyzed the main factors that influence home prices. They conclude that per-capita income, location of the property and the quantity of urban population are the main demand side determinants of home prices. Meanwhile, on the supply side, their study (2015) suggests that the supply of housing and the GDP of the country in question are significant determinants of the prices of homes. Savva (2018) studied the effects of certain macroeconomic variables for housing prices, and found that economic growth (rising GDP), returns from the stock market, as well as inflation are all factors that increase home prices. Meanwhile, Savva's (2018) study saw an adverse impact on the property market from rising construction costs, higher interest rates, as well as higher levels of unemployment. This is unsurprising, as higher interest rates and higher unemployment can, by way of economic fundamentals (more expensive mortgages and less purchasing power in the market), lead to a lower demand for mortgages, and therefore less demand from homebuyers.

Shiller (2007) takes another approach in explaining rising homes prices. Instead of using numeric variables that relate to economic fundamentals or the dynamics of the housing market, he takes a psychological approach in explaining the housing price boom seen in the United States between the late 1990s and the global financial crisis. He argues that a widespread perception of houses as a great investment, and the expectation that prices will continue to rise into the foreseeable future, created conditions in which investor demand for homes drove prices up. Therefore, he makes the case that psychological factors in the market influence housing prices, as the decision to buy a home is not necessarily made purely from rational grounds. (Shiller 2007)

Many of the factors that academic studies have found to drive home prices up can be found in Finland. Figure 7 shows the per capita GDP of Finland (2010 = 100) (Findikaattori 2020). From this graph, we can see that GDP growth per capita was strong from 1993 until the financial crisis, which began in 2008. As figure 6 showed, home prices in Finland also increased sharply during this period. However, the growth in prices in the Finnish capital region after the financial crisis cannot be explained by per capita GDP, which has not improved much from the days prior to the 2008 crash.

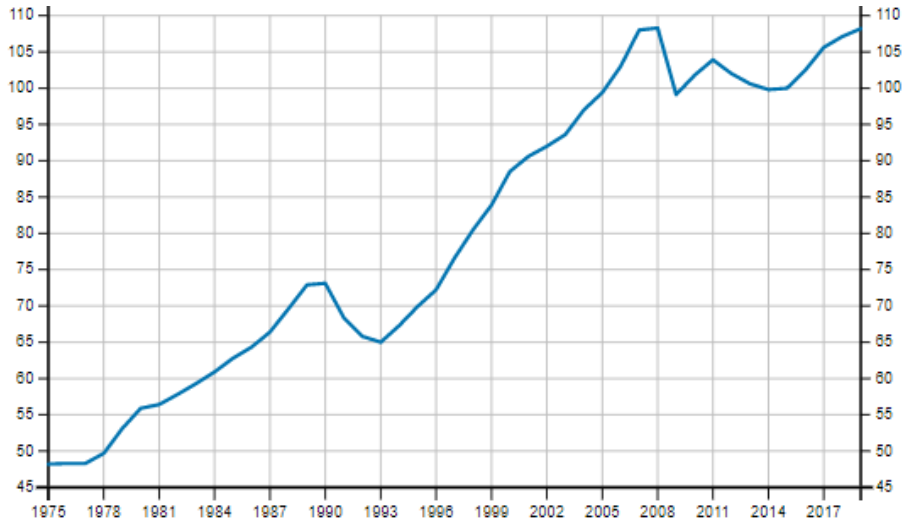

Figure 7. Per capita GDP of Finland, indexed from 2010 (Source: Findikaattori 2020, https://findikaattori.fi/fi/2)

Urbanization, an ongoing megatrend, means that increasing amounts of people are moving to live in cities, rather than outside them. This is a strong trend in Finland, where the current population growth prediction for 2040 states that populations will be mostly growing in bigger cities and their neighboring municipalities during the next two decades (Kuntaliitto 2020). Due to urbanization, demand for housing has grown strongly in bigger cities, such as Helsinki, which has driven home prices up in these locations. This is a key driver of the price growth seen in the real estate market of the Finnish capital region since the 2008-2009 crisis. Low interest rates can also be seen as affecting the housing market by driving property prices up, as mortgages become cheaper and therefore more attractive (Eerola 2016).

In Finland, the traditional notion has been that an owned home is a worthy investment, and that it is a purchase that all households should make at some point, if they are financially able to do so. This ownership-favoring attitude has been widely accepted, and it may be partially explained by non-economic factors as well. Kamppari (2018) notes

that the selection of households' living methods (renting vs owning) is influenced by many non-economic factors, such as the feeling of safety, stability, as well as the perceived level of decision-making power one has over their dwelling. These non-economic factors are typically viewed as favoring owner-occupied living, as owner-occupied housing is generally considered to be a more stable living option than renting, and homeowners are mostly free to customize their homes as they wish, while renters often lack this privilege. Still, it is important to consider whether or not the traditional view of owner-occupied housing as a cornerstone for wealth building in Finland is actually well grounded and supported by economic fundamentals.

Takala (2016) writes that increasing rents and decreasing mortgage interest rates have lowered the relative cost of owner-occupied housing, as opposed to renting. These trends have therefore increased the economic attractiveness of buying and owning a home. Additionally, it is easy to reason that in areas where home price appreciation has been strong (prices have risen strongly), namely the Finnish capital region (see figure 6), owning a home has been financially profitable on average. However, this does not necessarily mean that owner-occupied housing is automatically the best living option, even in areas with strong home price appreciation, as has often been traditionally thought in Finland. The results of this thesis should shed light on the profitability and financial viability of owner-occupied housing in different scenarios, when multiple variables are taken into account.

2.1.4 Comparisons between renting and buying

As the question of whether one should buy or rent their home is of great importance in many ways, one of those being financial, and because this topic is so central in our thesis, we need to take a look at how this topic has been approached in past literature. There exists, in fact, quite a lot of past studies on this topic, which have been conducted in many countries around the world, for example the United States.

Shelton (1968) examined the issue of owning vs renting a home already in the 1960s. He notes that the comparison between these two options is difficult to make due to different variables and underlying conditions, such as household differences and differences between homes, but makes the case that in a free market situation, where households can freely choose to either rent or buy their home, the costs of renting should

be (almost) equal to the costs of buying and owning a home. If this were not the case, the costs of renting vs buying would balance each other out, until they were equal, due to fundamental economic logic: if renting was cheaper, people would shift from owning to renting, increasing the price of renting until it would reach the price level of owning, and vice versa. Based on this assumption, Shelton (1968) builds an equation that should hold true if the above assumption is true. The formula is presented in equation 1, and it demonstrates the theoretical relationship between the costs of renting vs buying and owning a home. All variables in the equation are divided by the market value (MV) of the property to allow for generalizations of the analysis.

$$R \div MV = EC \div MV = PT \div MV + M \div MV + O \div MV + I \div MV + OC \div MV + (R \div MV)^{0.03} + (R \div MV)^{0.05} \quad (1)$$

In Shelton's (1968) equation, renting costs (R) are equal to the total economic costs of owning (EC). The costs of owning property are comprised of property tax (PT), maintenance costs (M), cost caused by the obsolescence of the property (O) (the building getting older, hence losing value), interest rate on a mortgage (I) and the opportunity cost of the money invested in the property (OC), respectively, as presented in the equation above. Additionally, because Shelton examines the issue from a landlord's viewpoint, the final two terms in the equation are vacancy allowance costs and management costs of the property, respectively. Vacancy allowance means that the landlord has to charge some extra rent to compensate for months when there is no tenant to pay any rent, and management costs are money paid to a management company that manages the property. These terms are raised to the powers of 0.03 and 0.05, respectively, to transform them to be applicable for the equation on an annual basis. These powers are estimated in Shelton's (1968) study based on then existing historical data.

However, from the viewpoint of a homeowner who lives in the home they own, vacancy allowance costs and management costs can be eliminated from the equation in equation 1 (Shelton 1968). Instead, they are replaced by the transfer cost, which occurs when the homeowner wants to sell their property to move elsewhere. This could include the commission of a real estate agent, for example. Additionally, Shelton (1968) points out that owners typically take better care of their homes than renters, allowing them to save money on maintenance costs. This allows him to conclude that if the owner's transfer cost is lower than the renter's vacancy allowance cost, management cost and the extra

maintenance cost combined, then owning is cheaper than renting, and vice versa. As the transfer cost is a one-time cost, and the others are annual costs, Shelton (1968) concludes that owning a home is the better choice over longer periods of time, when the savings on the costs incurred from renting are allowed to accumulate. Conversely, renting should be cheaper when the length of the tenure is shorter. The specific time period after which owning would be cheaper than renting naturally depends on the actual values of the parameters used in the analysis (Shelton 1968).

Kamppari (2018) agrees with Shelton's (1968) opinion that in a free market situation with perfect competition, the costs of owning and renting should be equal. However, this is not the case in reality, as according to Kamppari (2018), imperfections in the market, such as taxes and transaction costs, swift the balance in the favor of owning. Based on a study by Saarimaa and Eerola (2009), Kamppari (2018) concludes that the positive cost difference of owning compared to renting is equal to the taxes paid from profits generated from an (alternative) investment where the size and risk level of the investment are equal to the value of the owned home and the risk related to owning the home, respectively. As such, the higher investment taxes are and the higher the profits from alternative investments, the more the cost balance swifts to favoring owning over renting. These mechanics lead to a situation where households are essentially pushed towards owner-occupied housing, increasing the price of said housing (Kamppari 2018).

Continuing somewhat from the idea that in perfect market conditions the costs of renting and owning should be equal, Beracha, Seiler & Johnson (2012) have studied the required property appreciation rates (home value appreciation rates) that would be needed to make individuals indifferent between owning and renting in selected housing markets around the United States. They build their research model based on earlier research by Beracha & Johnson (2011), starting from the assumption that an individual either purchases or rents their home. If they choose to buy their home, then the wealth generated from this will be equal to the expected sales proceeds of the home, which are calculated from the resale price of the property after an expected holding period. On the other hand, if the individual chooses to rent instead, then the model will assume that the individual builds an investment portfolio for the same (expected) holding period. This portfolio will be built with money that the individual saves in homeownership related costs, such as the down payment of a home (Beracha et al. 2012).

Given the above situation, it should be obvious that if the sales proceeds (*SP*) of the bought property are larger than the investment portfolio (*IP*) that the individual could build

if they chose to rent, then the individual would prefer buying their home, and vice versa. On the other hand, if the sales proceeds of the property were equal to the value of the renter's investment portfolio, then the individual should be indifferent between buying and renting. These assumptions are presented in simple mathematical format in equation 2 from Beracha et al. (2012), where the term SP_{hp} represents the sales proceeds that the owner receives after selling their home at the end of the holding period, while the term IP_{hp} is equal to the size of the renter's investment portfolio at the end of said holding period.

$$\begin{aligned} SP_{hp} > IP_{hp} &\rightarrow Buy \\ SP_{hp} < IP_{hp} &\rightarrow Rent \\ SP_{hp} = IP_{hp} &\rightarrow Indifferent \end{aligned} \tag{2}$$

In order to calculate the needed property appreciation rates, i.e. hurdle rates, that should make individuals indifferent between buying and renting, Beracha et al. (2012) construct a few equations. The first of these represents the annual outflow of cash from homeownership related costs (OF_t), and is shown in equation 3 below, where IM_t refers to insurance and maintenance costs of the home, PT_t equals property tax, π is the marginal tax rate, P_t is the part of the mortgage payment that is going towards the principal, and i_t is the mortgage interest payment.

$$OF_t = IM_t + PT_t \times (1 - \pi) + P_t + i_t \times (1 - \pi) \tag{3}$$

The second equation from Beracha et al. (2012) describes the expected sales proceeds from the sale of the home at the end of the holding period (SP_{hp}, where hp refers to the holding period). This is depicted in equation 4, where the other terms are the following: $Price_0$ refers to the initial purchase price of the property, A is the average annual price appreciation of the property, SE represents the selling expenses in percentages of the property value, and MB_{hp} is the remaining mortgage balance at the end of the holding period.

$$SP_{hp} = Price_0 \times (1 + A)^{hp} \times (1 - SE) - MB_{hp} \tag{4}$$

The third and final formula that is required is depicted in equation 5 (Beracha et al. 2012). It describes the expected value of the renter's investment portfolio at the end of the

holding period (IP_{hp}). In the equation, IP_0 is the initial value of the investment portfolio, which represents some of the renter's saving on homeownership related costs. We can see that these savings are composed of the down payment of the home bought by the homeowner ($Price_0 - MB_0$), where MB_0 is the initial mortgage balance, as well as closing costs (CC) related to the purchase of a home. As for the other terms, the term R represents annual portfolio returns, $Rent_0$ is the initial yearly rent paid by the renter, G is the annual rent increase rate, and π_{CG} is the applicable capital gains tax rate. The other terms which were not covered here have the same meanings as in equations 3 and 4 that were presented earlier.

$$IP_{hp} = IP_0 + \left(\sum_{t=1}^{hp} (IP_{t-1} \times R + OF_t - Rent_0 \times (1+G)^t) * (1 - \pi_{CG}) \right), \quad (5)$$

$where$

$IP_0 = Price_0 - MB_0 + CC$

The results of the study from Beracha et al. (2012) show that hurdle rates (property appreciation rates that should make an individual indifferent between buying and renting) were below the observed 25-year average property appreciation rates in all regions and cities of the US that were included in the study. This means that the market was currently favoring owning over renting, as property prices were rising faster than what would be required to make owning equally attractive to renting. Additionally, hurdle rates around the US had been trending downwards since the beginning of the 1980s, so the trend was also favoring owning (Beracha et al. 2012). However, it must be noted that as this analysis is done and based partially on using past data, its future reliability is dependent on past trends continuing in the future as well. This is the case in many empirical studies focused on the buy vs rent decision.

Although there are some limitations to the research by Beracha et al. (2012), their study can be used as a building block for our own model, which will be presented later in the empirical section of this thesis. After looking at the buy vs rent decision from a more mathematical perspective, we can move on to other studies focused on this topic.

Milevsky (2010) approaches the question of renting vs buying from a viewpoint related to investment characteristics. In his opinion, most of the wealth of a young person is locked up in their human capital, which is obviously illiquid and non-tradeable. Therefore, it does not make sense for a young person invest a substantial part of their total

wealth into another form of wealth that is not very liquid either, such as housing. Additionally, Milevsky (2010) notes that housing is not a very diversified investment, as a house can only be located in one location at a time (and typically this location cannot be changed), so investing in a house resembles building a stock portfolio with only one stock in it, which is generally considered a bad idea. Bennett (2012) agrees with the idea that a house is not an ideal investment, and argues that the prices of homes cannot continue rising forever, ruining the main argument for buying a home, which is usually the expected future appreciation in the value of said home. Instead, Bennett (2012) urges individuals and households to choose renting over owning their home, so they can invest more of their income into alternative options, such as stocks, gold, and even stamps. Therefore, both Milevsky (2010) and Bennett (2012) disagree with the hurdle rates study from Beracha et al. (2012) that was presented earlier, which concluded that housing markets in the US were favoring owning over renting a home. This disagreement can be explained by different perspectives: Beracha et al. (2012) conducted on a current situation analysis using empirical data from the past, while Milevsky (2010) and Bennett (2012) have approached the buy vs rent requestion from a general perspective, which should be applicable at all times, regardless of the current housing market conditions.

So far, we have mostly been looking at the buy versus rent question from a financial perspective. This is natural, as the financial perspective is also the one we are using ourselves in this study. However, choosing between buying and renting is a decision that is often based on a multitude of factors, many of which are not financial, so it is useful to have some understanding of the other factors impacting this decision as well.

Based on research done by Dieleman, Clark & Deurloo (1989), Drew (2014) presents a life-course model that seeks to explain how changes in the life stages and characteristics of households impact their housing needs and desires, and can, for example, push households from renting towards owning, or vice versa. In this model, households are assumed to follow certain trajectories in their lives, such as certain economic, familial and geographical paths (Clark, Deurloo & Dieleman 2003). Changes in these trajectories, also known as trigger events, such as changes in the wealth of the household, their living location or family size, may impact the households needs or desires for housing. For example, the birth of a child may prompt a household to move to a bigger residence, or another area with better schools and other services for families, which may in turn increase the likelihood that the household chooses to buy a home instead of renting one (Drew 2014, citing Clark, Deurloo & Dieleman (1994), and Clark & Dieleman 1996). Thus, Drew

(2014) concludes that the life-course model offers some insights into the housing tenure decisions of households, particularly from a non-economic perspective.

Many social and psychological factors can influence a household's tenure choices. Morris & Winter (1978) investigated the effect of family and social norms on housing tenure decisions. They found that American households included in their study had a "predisposition" towards owning their homes. This was based on family and social norms that favored owning, such as the perceived stability of owner-occupied housing. Case & Shiller (1988) even found in their study that homebuyers in booming housing markets reported that their decision to buy a home had been influenced by the perceived excitement from purchasing a home. Thus, it is easy to conclude that even factors that should not matter to a rational individual can have an impact on the housing tenure choice. This fact needs to be recognized even when assessing the buy versus rent decision from a more rational or economical perspective.

2.1.5 Risks related to buying and owning a home

A home is an asset, and buying and owning assets generally comes with certain risks. In this chapter, we will take a look at the risks related to homeownership to further understand the setting of our study and to create some basis for our own risk analysis presented later in this study. We will exclude renting from this chapter, as renting is generally a more risk-free tenure choice as it does not expose the household to the risks presented in this chapter.

One of the risks related to homeownership is the liquidity risk. As mentioned previously, a home is generally considered an investment with poor liquidity, meaning it cannot be easily sold and turned into money, at least not if compared to other asset classes, such as stocks. Oinonen (2013) attributes this illiquidity to characteristics of the housing market, as it is a market where a limited amount of buyers are looking for dwellings, while there is a limited supply of dwellings offered to them. Thus, a home with the features desired by a particular buyer may not always be available on the market. This is especially true in areas with low population density, like much of Finland, as these areas have less buyers and sellers active in the market. Additionally, transaction costs, information asymmetries in the market and other factors lower the liquidity of homes (Oinonen 2013). While the liquidity of a certain home depends on multiple factors, a homeowner always

has to bear the risk of potentially being unable to sell their home when they want to, or the sale of said home taking a longer time than anticipated.

Many studies exist that have examined the liquidity risk related to homeownership, and the liquidity of real estate in general. Kramer (2001) defines the concepts “hot” and “cold” real estate markets. Out of these, a “hot” market is one where demand for real estate is high, and thus, prices are rising and selling times are short. A “cold” market is, conversely, a market where prices are falling and selling times are long as a result of lower demand. The existence of these hot and cold markets is very prevalent in Finland, where average home selling times in certain cities, such as Helsinki, are generally much shorter than in most other places in the country, particularly the countryside. Devaney, McAllister & Nanda (2015) note that in markets with higher transaction activity, i.e. hot or “hotter” markets, liquidity is typically thought to be higher because there are more buyers and sellers in the market, which can shorten sale times. They also state that liquidity is pro-cyclical, meaning that during times of strong market conditions, liquidity is higher. This means that, for example, when economic growth is strong, the housing market tends to do better and sale times are shorter (Sfgate 2018). This is apparent on the macro level, as the 2008-2009 financial crisis for example caused a crash in real estate transaction volumes in the US (Devaney et al. 2015).

Figure 8 from Eerola, Lyytikäinen & Vanhapelto (2020) shows the average selling times of homes in different locations in Finland. From this graph, we can see that the average selling times of homes in Finland have been rising slightly since the year 2010. This means that the liquidity of homes has been falling, and liquidity risks have increased. Rising selling times can be an indicator that in order for the seller to get at least the same price from their home that they paid for said home, they have to wait a longer time for a suitable buying offer (Eerola et al. 2020). The risk that the home is not sold at all increases then as well.

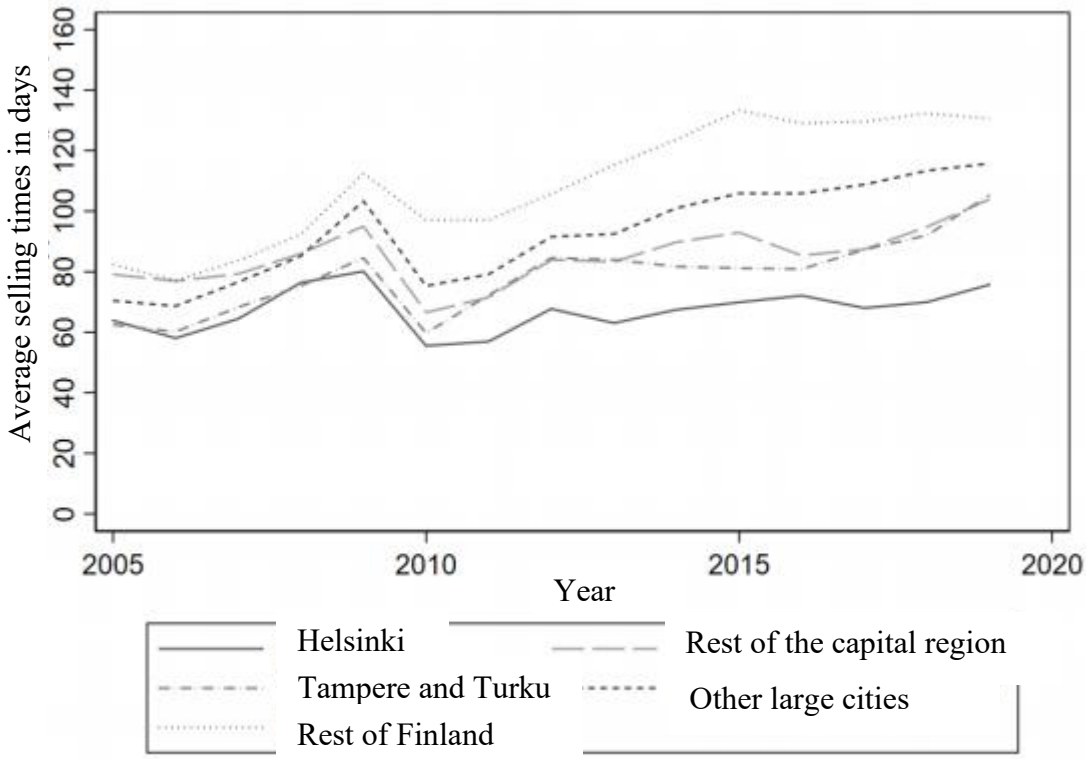

Figure 8. Average selling times of homes in days in different locations in Finland (Source: Eerola, Lyytikäinen & Vanhapelto 2020, https://www.doria.fi/handle/10024/180172)

Another rather obvious risk related to owning a home is the potential loss of value of said home that can occur. As we saw earlier in figure 6, this risk has been realized on average in Finland outside the capital region after the financial crisis. This trend is likely to continue, especially in the Finnish countryside, where populations are shrinking and therefore demand for housing decreases. Conversely, the strong growth in real estate prices seen in the Finnish capital region is likely to continue, given the strong demand there driven by urbanization, as well as cheap credit offered by banks in the current record low interest rate environment. Therefore, the risk of loss of home value is high mostly in smaller cities and the countryside in Finland.

A third risk related to home purchasing is credit risk. This risk, of course, concerns only those homeowners who use a mortgage (credit) to finance at least a part of their home (this includes most homeowners in Finland). The credit risk is related to whether or not the homeowner is able to pay back their mortgage – if they cannot pay back the mortgage, they can default on it, which may result in a foreclosure. Naturally, the higher interest rates are, the higher the credit risk, as paying back the mortgage becomes more expensive and therefore more difficult when interest rates rise, so it is worth considering the trends in interest rates to try and estimate this risk.

Figure 9 shows the 12-month Euribor interest rates, as set by the European Central Bank (ECB) (Euribor rates.eu 2020). Most mortgages in Finland are tied to some Euribor rate, so we can use the 12-month Euribor rate to assess the state of mortgage rates at different times. From this graph, we can see that interest rates have plunged since the financial crisis, and are currently at a negative level. This means that mortgages are currently cheap, and the risk of defaulting on one is therefore lower.

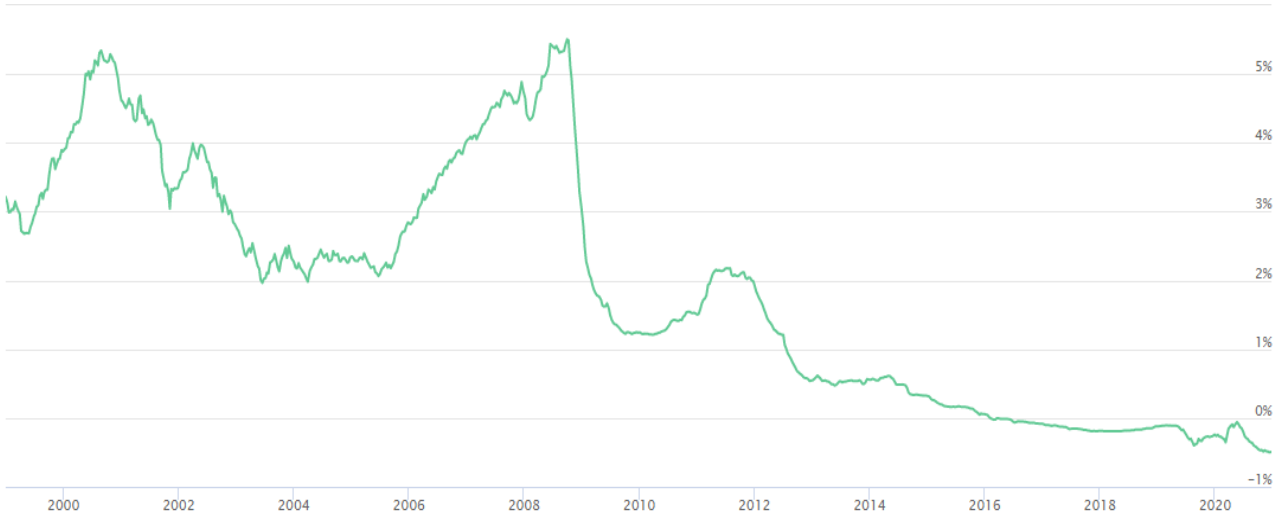

Figure 9. 12-month Euribor interest rate (Source: Euribor rates.eu 2020, https://www.euribor-rates.eu/en/euribor-charts/)

Future trends in interest rates are known to be difficult to predict, but as Pellikka (2019) notes, households should minimize their mortgage-related credit risks by keeping their mortgage balances at a reasonable level. This may be difficult to do in areas where home prices are rising, and therefore households are forced to take on larger mortgages to finance their home purchases.

2.1.6 Taxation of buying and owning vs renting a home in Finland

Building a model to empirically determine whether renting or buying a home is the better option in a given situation requires us to be aware of the existing taxation imposed on different living options. Additionally, for the purposes of our research topic, it is worthwhile to examine the existing research regarding the taxation of rented and owner-occupied housing. In this chapter, we will look at the different taxes imposed on housing, as well as discuss the implications of taxation on the buy vs rent question.

Several forms of taxation are imposed on housing in Finland. When new housing is built, a value added tax (VAT) of 24% is added to the price of the homes when they are first sold. When buying property in general, the buyer has to pay wealth transfer tax (first-time buyers aged 18-39 are exempt from this, if buying property for their own use) equal to 2% or 4% of the value of the property (Verohallinto 2020). A property owner has to pay between 0.41%-0.90% of property tax on their property annually, depending on the type and location of their property. Finally, if a home is sold for a higher price than what it was bought for, capital gains tax may have to be paid for the difference between buying and selling price. This gain is taxed at the same rates as capital gains from other assets.

All of the taxes described above are attached to owner-occupied housing only, meaning a tenant who rents their home does not need to worry about them. However, as Reijonen (2018) notes, the taxation system in Finland greatly favors owner-occupied living over renting. Historically, one of the most important forms of tax handouts to homeowners in Finland has been the right to subtract some or all of the homeowner's mortgage interest expenses from their annual taxable capital gains or investment income. It is worth noting that this right has been gradually lessened since 2012 (Reijonen 2018), and starting from 2023, mortgage interest expenses will not be tax deductible at all, meaning homeowners with mortgages will lose this benefit entirely. Eerola, Lyytikäinen and Saarimaa (2014) argue that this might push homeowners with mortgages to use their other assets to pay off a part or all of their mortgage to effectively reduce their interest expenses, while also making households postpone their decision to buy a home.

Homeowners who have lived in their home for more than 2 years and who sell their home for a profit are exempt from paying capital gains tax for said home in Finland. Eerola et al. (2014) note that this tax support is very significant in Finland due a significant portion of Finnish households' wealth being tied to housing. They also argue that this tax exemption may improve the mobility of households in Finland, as a household does not need to hold their home just to avoid paying capital gains tax on it, if the value of the home has risen since they bought it. Nevertheless, this exemption from capital gains tax means that owner-occupied homes are taxed differently than other assets, increasing their attractiveness relative to other assets, such as stocks.

Since the wealth transfer is usually paid by the buyer of a home but avoided by renters, it could be seen as a mechanism that should push an individual who is looking for housing more towards renting instead of buying a home. However, there is evidence that the wealth transfer tax, which lifts the prices of homes, also increases rents, in which case

renters would lose the benefit of seemingly avoiding the wealth transfer tax as opposed to most homebuyers. Contrary to the exemption from capital gains tax offered to homeowners in Finland, wealth transfer tax may cause people to move around less often, thus reducing mobility and causing negative effects for the economy and households (Eerola et al. 2014).

Since value added tax (VAT) and property tax are paid in equal amounts no matter if the property is being used by the owner themselves or being rented out, these taxes do not really have an impact that would favor owning or renting specifically (Eerola et al. 2014). Although a renter does not have to pay any VAT or property tax on their home (since they do not buy it or own it), these taxes are typically reflected in the rent they pay, as the landlord needs to cover these costs from the rent paid by the tenant. This mechanism was already hinted in the formula presented by Shelton (1968), which was shown in equation 1.

We conclude that multiple taxes and tax exemptions effect the decision of whether one should buy or rent their home in Finland, and many of these shift the balance towards favoring owning over renting. This homeownership-favoring tax policy may reduce a household's ability to choose how to invest their wealth and how to divide their investments among different asset classes, such as real estate or securities (Eerola et al. 2014). However, some of these taxation benefits for homeowners are currently being reduced, an example being the ongoing gradual decline in the tax deductibility of mortgage interest payments. This may be healthy as a whole, as taxation should not generally overly favor one tenure choice over another.

2.2 Stock market studies

2.2.1 The stock market

The stock market is a market where stocks (also known as shares) of different companies are exchanged between buyers and sellers. The shares of publicly listed companies are traded in stock exchanges around the world, which provide a place and a platform for buying and selling stocks quickly, securely and with low costs (Saario 2020). In this thesis, when examining topics related to the stock market, we will focus only on publicly listed companies, meaning non-public (private) companies are ruled out of the scope of this study.

Modern technology and the free movement of capital have made it possible for almost anyone who has access to a computer, an internet connection and the necessary funds to invest in publicly listed stocks all around the world, and in Finland, the popularity of investing in stocks has been increasing in recent years (Finanssiala 2017). This is depicted in figure 10 from Pörssisäätiö (2020), which shows the number of Finnish individuals who own Finnish stocks listed on the Helsinki Stock Exchange. However, traditional savings accounts (bank accounts that offer a low return) have maintained their position as the most popular savings method despite the record-low interest rate environment, in which these accounts offer almost no return on the money kept in them. Unsurprisingly, risk aversion and safety are among the most important criteria for Finns when choosing where to invest their money (Finanssiala 2017).

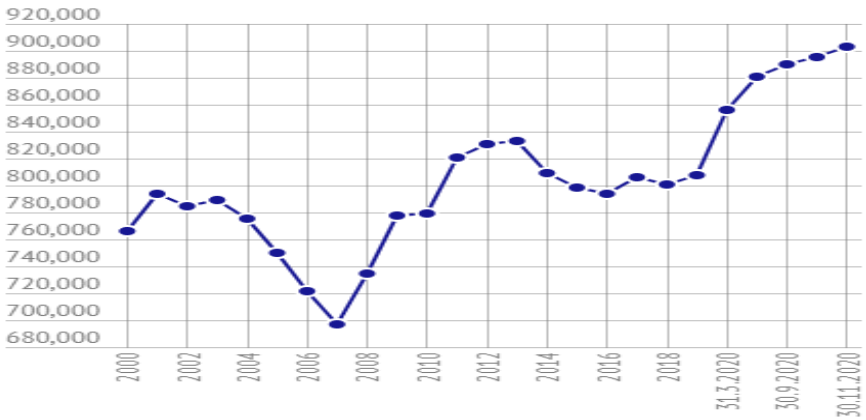

Figure 10. Number of Finnish individuals who own stocks listed on the Helsinki Stock Exchange (Source: Pörssisäätiö 2020, https://www.porssisaatio.fi/blog/statistics/kotitalousomistajien-maara-suomessa/)

2.2.2 Returns on stock investments

When discussing investing in the stock market, the returns from these investments are often in the center of the conversation. This is natural, as the ultimate purpose of stocks is, of course, to generate profit for their owners.

Returns from stock investments are also a very central part of the empirical calculations presented later in this thesis, and they greatly impact the answer to our main research question. Due to this, we must conduct a thorough examination of which factors affect potential future returns from stocks and how the topic has been studied in past literature. We will also be looking at the observed average returns from different portfolios and stock markets around the world.

The returns from a stock are composed of two parts, as presented in figure 11: price appreciation (the stock goes up in value) and dividend (Saario 2020). The dividend is essentially a part of the firm's profit that is distributed to shareholders, who are naturally also the owners of the company.

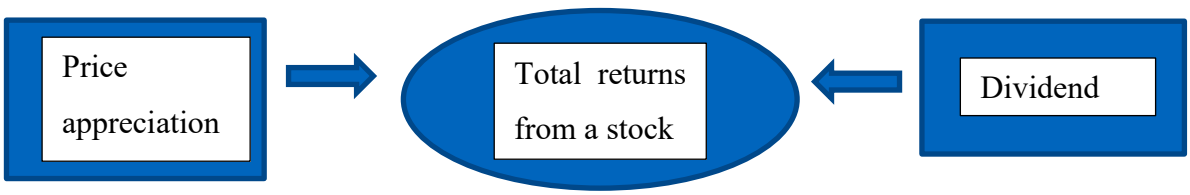

Figure 11. The composition of returns from a stock investment

The prices of stocks are fundamentally set by supply and demand, just like with other assets. Dividends, on the other hand, are dependent on the company's profits and dividend policy: the more profit a firm makes, the more it is generally able to pay out as dividends, however, it is up to the company's management to decide how much dividend is actually paid out. Generally, firms pay out between 0-100% of their profit as dividend, though this is not always the case, and dividends may also sometimes be paid even if the company has made no profit during a certain time period for which the dividend is paid.

There exists a large body of previous studies that have examined which factors impact returns from the stock market. A basic formula used to estimate stock prices is presented by Chen, Roll and Ross (1986), and is seen in equation 6. In this formula, the price p of a stock is calculated by taking the expected future dividends $E(c)$ that the stock should generate, and diving them with the applicable discount rate k.

$$p = \frac{E(c)}{k} \tag{6}$$

The obvious implication from equation 6 is that the prices of stocks increase when dividends increase and discount rates decrease, and vice versa (Chen et al. 1986). The researchers state that the discount rate k is an average of interest rates over time, and it is affected by both risk-free interest rates as well as the market's risk premium.

In their study, Chen et al. (1986) found that certain economic state variables, such as the growth of industrial production, changes in the risk premium, as well as changes in the yield curve (interest rates as a function of bond maturity) affect stock prices over the long term. However, Maysami & Koh (2000), who examined the relationship between certain macroeconomic variables and the Singapore stock index, found that changes in trade and industrial production were not integrated of the same order as changes in the Singapore stock market. These conflicting results suggest that there is more to explaining the trends in stock prices and the returns from the market.

A number of other studies have found certain variables to be successful in predicting returns from the stock market. Cakmakli & van Dijk (2010), quoting Keim and Stambaugh (1986), Campbell and Shiller (1988), Fama and French (1988), Ferson and Harvey (1991), Ang and Bekaert (2007), Campbell and Thompson (2008), as well as Wachter and Warusawitharana (2009), state that the best variables in predicting stock returns have been certain valuation-related and financial variables. These include, but are not limited to, the price-to-earning ratio (P/E-ratio, calculated by dividing the stock price by company

earnings), dividend yield (dividend divided by stock price), book-to-market ratio (shareholders' equity divided by company market cap), the short-term interest rate, credit rate, and yield spread. Generally, lower stock valuation, identified by low P/E- and book-to-market ratios, as well as high dividend yields, are indicative of higher future returns from the stock market. Lower interest rates can also predict higher returns from the market, as they indicate higher stock prices due to lowering the discount rate k found in equation 6. However, Welch & Goyal (2008) argue against this view, claiming instead that no single predictor variable can do better than the historical average return rate of the stock market in predicting stock returns over longer time periods.

It is commonly thought that the stock market should be linked to economic fundamentals, and therefore the returns from stocks should be affected by events in the real economy. However, Cakmakli & van Dijk (2010) state that most macroeconomic variables, like the growth of economic output or inflation rate, do not add much predictive power to stock returns outside their impact to valuation and interest rate related metrics. Still, Cakmakli & van Dijk (2010) found that when macroeconomic variables are combined into factors using principal component analysis, these factors do indeed have predictive power in predicting US stock returns during the time period of 1980-2005. Their conclusion is that the combination of numerous macroeconomic variables can be useful in the prediction of future stock returns after all.

It is clear from existing literature that while stock returns are by nature dependent on trends in stock prices and dividends paid to shareholders, a large number of economic and valuation-related variables can be used in the estimation of future returns, with varying success. We can now take a look at the average realized returns of stock investments from different portfolios, markets and time periods.

Bauman, Conover and Miller (1998) examined the performance of small-cap vs large-cap stock portfolios in international markets. Their dataset was quite extensive, containing over 28 000 return observations from 21 different countries over the 10-year time period between 1986-1996. They found that while the standard deviation of annual returns of small-cap stocks was significantly higher than that of the large-cap stocks, the small-cap stocks also yielded a much higher on-average profit, returning an average of 22.0% annually, compared with the 10.8% annual return on large-cap stocks. This tendency of small-cap stocks producing greater returns than their larger counterparts is commonly known as the small-cap anomaly, and may be explained with the higher risk that comes with investing in small-cap companies (Hämäläinen, Oksaharju & Walker

2019). The results are somewhat contradictory with Lehtinen's (2013) study, where small-caps were found to have produced the worst returns over the study's time period of 2002-2011. However, this may be at least partially explained by the 2008-2009 financial crisis and the European debt crisis in 2010-2011, which both took place during the study period used in Lehtinen's (2013) study. This view can be taken to explain the study's results, as the stocks of small-cap companies often tend to do worse than large-caps in times of crisis.

Before taking a closer look at the average realized profits from different stock markets around the world, we must first define the concept of a stock index. An index is a method that is used to track the price performance of a group of assets in a standardized way (Chen & Scott 2020). A stock index is usually composed of different stocks that might belong to a certain industry (e.g. information technology), or the index can include all stocks listed in a particular stock exchange. This way, by following the index, investors can quickly get a high-level view of the development in stock prices in a particular market or industry.

Dimson, Marsh and Staunton (2020) have examined the real (inflation-adjusted) average annual returns from stock markets in selected countries during the 119-year long time period between 1900 and 2019. Their results are presented in figure 12, where the average annual returns are calculated in percentage terms using both the local currency and the US dollar (USD).

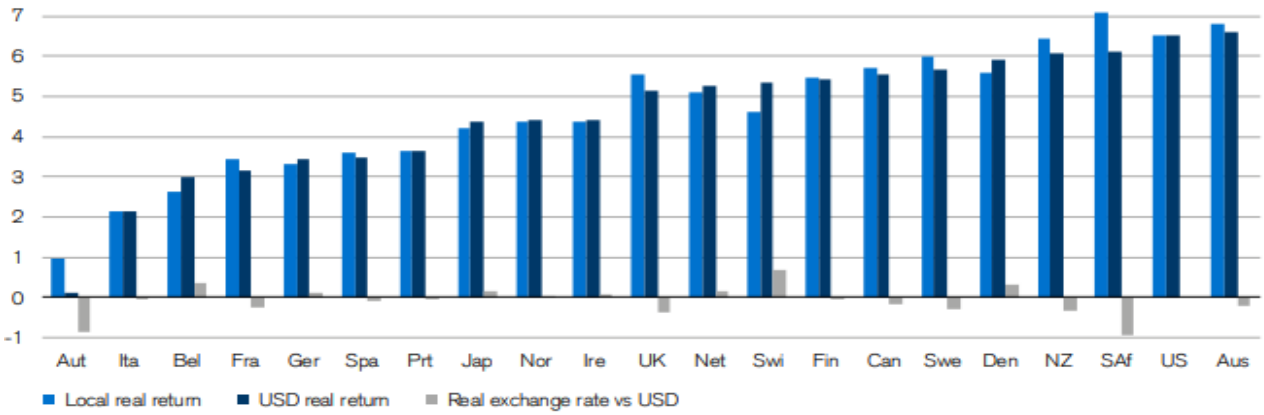

Figure 12. Average annual returns (%) in real terms from selected stock markets around the world. Local real return refers to returns calculated using the local currency. (Source: Dimson et al. 2020, https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html)

From the graph above, we can see that the US stock market has done very well in yielding returns for investors, ranking 2nd in the comparison overall. The Finnish stock

market ranks 8th, having produced an average real return of about 5.5% for investors annually.

The Helsinki Stock Exchange (Nasdaq OMX Helsinki) is of particular interest to our study, as we will be using the past realized returns from investments in this stock exchange in the empirical calculations presented later in this thesis. Due to this, we must take a closer look at the historical trends in returns from the Helsinki Stock Exchange.

Price changes in stocks listed in Helsinki Stock Exchange are reflected in the exchange's general purpose index, the OMXHPI index, which includes all stocks listed in the Helsinki Stock Exchange, expect for those that are listed in the First North Growth Market Finland marketplace, which is reserved mostly for smaller companies aiming for rapid growth. Figure 13 shows the trends in the OMXHPI index, starting from June 1995 (MarketWatch 2021).

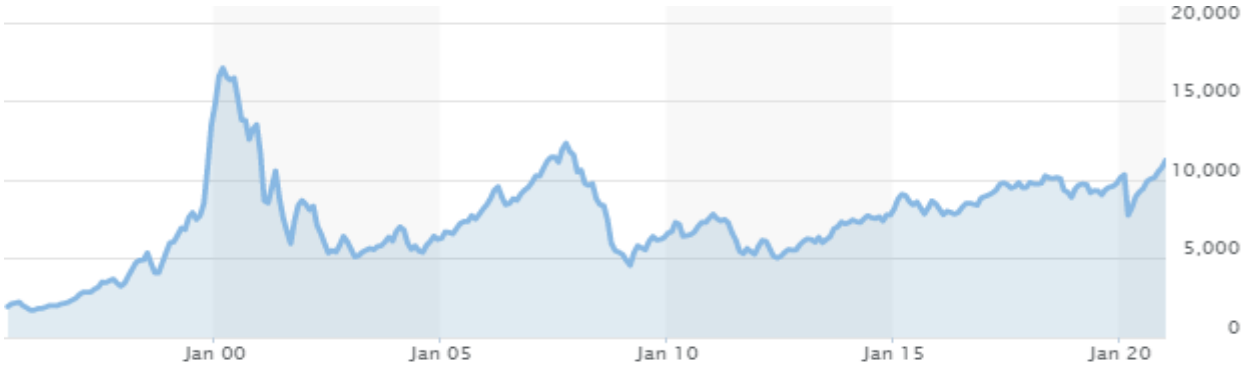

Figure 13. The OMXHPI stock index during the time period 06/1995-01/2021 (Source: MarketWatch 2021, https://www.marketwatch.com/investing/index/omxhpi?countrycode=fi)

From the graph above, we can see that stock prices in the Helsinki Stock Exchange have fluctuated a lot since the mid-1990s. Although the general trajectory of the index seems to be going up, there are certain "spikes" in the index, such as in early 2000 (commonly known as the dot-com bubble) and just before the 2008-2009 financial crisis. If one had invested their money into the market at these moments, they would still not have made a profit, despite the considerable amount of time that has passed. This means that the timing of the investment can have a significant impact on the profits that are generated.

2.2.3 Risks related to stock investments

While investments in the stock market offer attractive return prospects, they naturally come with certain risks, just like any investment. A generally accepted principle is that higher risk comes with higher returns, and the lucrative returns from stocks are partly explained by their riskiness, as stocks are widely considered to be risky assets that carry a higher level of risk than many other investment options, such as bonds or real estate. In this chapter, we will take a look at the type of risks that come with stock investments, and how these risks can be measured and controlled.

The main risk related to stock investments is obviously related to the potential loss of value of the investment. This risk is generally divided into two components: market risk and company risk (Saario 2020). Market risk is related to the general conditions that exist in the stock market. On the short-term, stock prices are influenced by a large number of factors, some of which are irrational. These include, for example, investor sentiment and psychology, political events, and economic news that are released. This causes most of the observed fluctuation in stock prices, which is seen, for example, in figure 13 for the OMXHPI index. Market risk therefore refers to the risk that especially in the short term, a stock investment's value may decrease due to the existing general market conditions. This can mean that the investment's value may decrease "automatically" when prices in the general stock market fall.

All investors who have invested any capital into stocks generally have to carry some level of market risk. Company risk, on the other hand, refers to the risks that are related to a specific company that one chooses to invest in. This risk relates to the possibility that events that negatively affect the company's current or future profits can impact the company's stock price and dividends negatively.

Common risk measures, which can be used to measure market risk and company risk are volatility and beta. Both of these are used to measure how much the price of an asset tends to fluctuate, and a higher value indicates more price fluctuation, and therefore more risk.

Volatility is commonly calculated either as the standard deviation or the variance of an asset's historical prices. It therefore measures the dispersion of the asset's returns

around its mean price (Kuepper 2020). A higher value indicates a riskier asset, which therefore should offer better return prospects as well.

Beta (β) is a risk measure that indicates how much the price of an asset is likely to change relative to some underlying benchmark index, such as the OMXHPI index for the Helsinki Stock Exchange (Kuepper 2020). For an asset with a beta value of 1.0, the price changes for this asset are likely to be of the same magnitude as the price changes for the underlying stock index, as the index also always has a beta value of 1.0. This means that, for example, if the index value increases by 100%, then the value of the asset will likely increase by 100% as well based on historical data. On the other hand, if the beta for an asset is 1.1, then, for every 100% increase in the index value, the asset's value should increase by 110%. The value of the beta can also be less than that of the index (<1.0). Assets with a beta less than 1.0 are considered to be defensive, while assets with a beta above 1.0 are often called aggressive assets, as they come with a higher price fluctuation than the index that they are compared to (Saario 2020).

It is worth noting that neither volatility or beta are able to predict the returns of an asset in the future, nor do they provide any insight as to whether or not the investment in question is actually a good investment. They are simply mathematical indicators that hint how much the price of an asset is likely to fluctuate. Still, they are very common and useful risk measures, and provide a way to objectively calculate and compare the riskiness of different assets.

Market risk is often realized when an investment in the stock market is made at the wrong moment, such as just before a major downturn occurs in the market. An example of this would be investments made just before the spring 2020 stock market crash, which was caused by panic related to the coronavirus pandemic (see figure 13). To counteract the issue of investing at the wrong moment, however, one should generally divide their investments to different moments or periods of time, such as investing once a month (Hiltunen & Leskinen 2013). This will significantly lower the risk of losing money as a result of investing at the wrong point in time. Additionally, the risk of investing at the wrong time is typically lower when the investment is held for a long time (although this does not completely eliminate the risk, as seen from figure 13).

Company risk can be controlled mainly by diversification of the stock portfolio. This means that, instead of investing in only a single stock, investors should pick multiple different stocks into their portfolios in order to reduce the total variance (volatility) of the portfolio's value.

In addition to the rather obvious risk of a potential loss in the investment's value, stocks may also come with another risk: the liquidity risk, which was already discussed for homes to some extent earlier in this thesis. While liquidity risk essentially refers to the same risk, no matter if considering stocks, real estate or some other form of investment, its magnitude and management are generally not the same for stocks as for many other asset classes, such as real estate.

Black (1971) defines four conditions that must hold for a stock to be considered liquid. These conditions are:

1. There are bid and ask prices (market-set buying and selling prices) offered to an investor who wants to buy or sell a small amount of stock instantly.
2. The price spread, meaning the difference between the bid and ask prices, is small.
3. Anyone who is trading a large amount of stock can do so over a longer time period at a price that does not differ much from the current market price, on average.
4. An investor may buy or sell a large amount of stock instantly, but this would happen with a premium or a discount, respectively. The size of the premium or discount depends on the amount of stock that was traded.

Based on the above, it should come as less of a surprise that the bid-ask spread (or price spread) is a common way to measure the liquidity of a stock, as noted by Lagas (2011). Norvaišienė & Stankevičienė (2014) point that the bid-ask spread is typically smaller for larger companies, whose stocks are therefore more liquid.

2.2.4 Taxation of stock investments in Finland

Taxation of stock investments in Finland is generally done in the form of capital gains tax. We will now first be looking at capital gains taxation in Finland on a general level, and then examine the taxation of dividends separately.

Investment income is defined in Finland as any income that is generated by some form of wealth, such as real estate, stocks, and so on (Verohallinto 2017). Examples of investment income include rental income for a landlord, capital gains income generated from selling stocks for a higher price than what they were bought for, or interest income from a bond. Dividends are also considered to be investment income, but the effective tax rates for dividends in Finland are a bit different from other investment income forms.

Outside dividends, investment income is directly taxed in Finland according to the capital gains tax rates shown in table 1 below (Verohallinto 2017).

Table 1. Capital gains tax rates in Finland

Amount of taxable investment income per year	Capital gains tax rate
30 000 EUR or less	30%
Over 30 000 EUR	34%

Costs that occurred in the process of generating investment income are generally deductible in capital gains taxation. These costs may include, for example, an internet connection, or the purchase of investment-related books. Additionally, losses that are generated from selling an asset for a lower price than what it was bought for are tax deductible in capital gains taxation for the next five years. (Verohallinto 2019)

The taxation of dividends in Finland is based on the same capital gains tax rates that apply to other forms of investment income as well (see table 1), but their effective tax rates are lower. It is worth noting that dividends are taxed differently for publicly listed and private companies, but in this thesis, we will only examine the taxation of dividends for publicly listed companies. Dividend income from publicly listed companies is only taxable in Finland for the first 85% of the income amount, while the rest 15% are tax-free. This effectively means, taking into account the capital gains tax rates from table 1, that dividend income in Finland is taxed at a rate of 25.5 or 28.9 per cent, depending on whether the income exceeded 30 000 € annually or not, respectively. (Veronmaksajat 2020)

3 Empirical analysis

In this section, we will be presenting the empirical analysis conducted as part of this study. We begin by presenting our analysis on the rent versus buy decision, attempting to create a model which can be used to decide whether an individual should buy or rent their home in Finland, if we assume that they will invest any leftover income after housing costs into the Finnish stock market. We will also present a description of the data collection and preparation process that was conducted in the making of this study, after which we will apply our constructed model to different historical scenarios in Finland. Finally, we will present a risk analysis that will attempt to answer which of the two options (buying or renting) has been riskier.

3.1 Buying versus renting a home

In this chapter, we will present a model for answering the buy versus rent question in our defined research setting. We will first begin by building a mathematical model based on our research setting. After this, the definitions of all of the variables used in the model and a description of the data collection process conducted as part of this study will be presented. Finally, we will use our defined model and the collected historical data to solve the buy versus rent problem in a number of historical scenarios.

3.1.1 Model formation

We will now present a set of mathematical equations that will be used as the basis of our calculations that we will conduct in order to find answers to our research question. The basis of our model is shown in equation 7, and it follows the example laid earlier by Beracha et al. (2012), which was presented in equation 2.

In equation 7, the term RP represents the value of the renter's portfolio at the end of the examined time period, while the term OP refers to the value of the homeowner's

portfolio after that same period. Our basic assumption therefore is that if the renter's portfolio is more valuable than the owner's portfolio at the end of the examined time period, then renting will be more favorable, and vice versa, as shown in equation 7 below.

$$\begin{aligned} RP > OP &\rightarrow Rent \\ OP > RP &\rightarrow Buy \end{aligned} \tag{7}$$

The next step is to define the equations that can be used the calculate the values of the terms RP and OP in a given scenario. All of the required equations are presented below in equations 8 and 9.

$$\begin{aligned} OP = {} & Price_0 \times (1+A)^{a \div 12} \times (1-TC) - WT \times Price_0 \\ & + \sum_{m=1}^{a} \left(IS_{o,m,t} \times (1+R_m)^{(a-m) \div 12} \right) - MB_f - cgt_o \\ & where \\ & IS_{o,m,t} = P_{m,t} \; iff \; MB_{m,t} = 0, else \; IS_{o,m,t} = 0 \\ & and \\ & cgt_o = \sum_{t=1}^{a \div 12} \left(\sum_{m=1}^{12} \left(IS_{o,m,t} \times {R_{m,t}}^{(12-m) \div 12} \right) + SP_{o,t-1} \times R_t \right) \times c \end{aligned} \tag{8}$$

$$\begin{aligned} RP = {} & (Price_0 - MB_0 + WT \times Price_0) \times \left(1+R_f\right)^{a \div 12} \\ & + \sum_{m=1}^{a} \left(IS_{r,m,t} \times (1+R_m)^{(a-m) \div 12} \right) - cgt_r \\ & where \\ & IS_{r,m,t} = M_t + P_{m,t} + i_{m,t} - Rent_t \\ & and \\ & cgt_r = \sum_{t=1}^{a \div 12} \left(\sum_{m=1}^{12} \left(IS_{r,m,t} \times {R_{m,t}}^{(12-m) \div 12} \right) + SP_{r,t-1} \times R_t \right) \times c \end{aligned} \tag{9}$$

Explanations on all of the variables presented in equations 8 and 9 above are given in table 2 on the next pages.

Table 2. Explanations for the variables presented in the formulas in equations 8 and 9. Variables with the percentage marker (%) present in the meaning field will be used in their decimal format

Symbol	Meaning
OP	$Value\ of\ the\ owner's\ portfolio\ at\ the\ end\ of\ the\ examined\ time\ period$
RP	$Value\ of\ the\ renter's\ portfolio\ at\ the\ end\ of\ the\ examined\ time\ period$
$Price_0$	$Initial\ price\ of\ the\ home, paid\ by\ the\ homeowner$
A	$Annual\ home\ price\ change\ during\ the\ examined\ time\ period\ (\%)$
TC	$Transfer\ cost\ that\ occurs\ when\ the\ home\ is\ sold\ (\%)$
WT	$Wealth\ transfer\ tax\ (\%)$
a	$Length\ of\ the\ examined\ time\ period\ in\ months$
m	$Month\ in\ question, used\ when\ calculating\ monthly\ sums$
t	$Year\ in\ question, used\ in\ sum\ calculations. Unless\ stated\ otherwise,$ $can\ be\ calculated\ with\ the\ formula\ t = m \div 12,$ $where\ \boldsymbol{m}\ comes\ from\ the\ sum\ clause,$ $and\ with\ the\ result\ rounded\ up\ to\ the\ nearest\ integer$
MB_0	$Initial\ mortgage\ balance$
$MB_{m,t}$	$Remaining\ mortgage\ balance\ in\ a\ given\ month\ \boldsymbol{m}\ and\ year\ \boldsymbol{t}$
MB_f	$Remaining\ mortgage\ balance\ after\ the\ examined\ time\ period$
$IS_{o,m,t}$	$Investable\ sum\ for\ the\ owner, i.e.\ the\ amount\ of\ money\ the\ homeowner$ $can\ invest\ in\ the\ stock\ market\ in\ a\ given\ month\ \boldsymbol{m}\ and\ year\ \boldsymbol{t}.$ $Can\ only\ be\ positive\ if\ the\ owner\ has\ fully\ paid\ off\ their\ mortgage.$
$IS_{r,m,t}$	$Investable\ sum\ for\ the\ renter, i.e.\ the\ amount\ of\ money\ the\ renter$ $can\ invest\ in\ the\ stock\ market\ in\ a\ given\ month\ \boldsymbol{m}\ and\ year\ \boldsymbol{t}.$ $Calculated\ by\ subtracting\ the\ renter's\ living\ costs\ from\ the\ owner's$ $living\ costs.$
R_m	$Return\ from\ investments\ placed\ during\ month\ \boldsymbol{m}\ in\ the\ stock\ market$ $and\ held\ to\ the\ end\ of\ the\ the\ examined\ time\ period\ (\%)$
R_f	$Return\ from\ investments\ in\ the\ stock\ market\ made\ in\ the\ beginning$ $and\ held\ to\ the\ end\ of\ the\ examined\ time\ period\ (\%)$
$R_{m,t}$	$Return\ from\ investments\ placed\ during\ month\ \boldsymbol{m}\ and\ year\ \boldsymbol{t}$ $in\ the\ stock\ market\ and\ held\ to\ the\ end\ of\ year\ \boldsymbol{t}\ (\%)$
R_t	$Return\ from\ investments\ placed\ in\ the\ beginning\ of\ year\ \boldsymbol{t}$

	in the stock market and held to the end of year $\boldsymbol{t}$ (%)
cgt_o	*Amount of capital gain tax paid by the owner for the entire examined period*
cgt_r	*Amount of capital gain tax paid by the renter for the entire examined period*
$SP_{o,t}$	*Value of the owner's stock portfolio at the end of year* $\boldsymbol{t}$
$SP_{r,t}$	*Value of the renter's stock portfolio at the end of year* $\boldsymbol{t}$
c	*Capital gain tax rate at the end of the examined time period* (%)
M_t	*Monthly maintenance costs of the home paid by the homeowner a given year* $\boldsymbol{t}$
$P_{m,t}$	*Homeowners' mortgage payment going towards the principal on a given year* $\boldsymbol{t}$*, in a given month* $\boldsymbol{m}$
$i_{m,t}$	*Homeowners' mortgage payment going towards the interest on a given year* $\boldsymbol{t}$*, in a given month* $\boldsymbol{m}$
$Rent_t$	*Monthly rent paid by the renter on a given year* $\boldsymbol{t}$

It should be noted that in case the homeowner has fully paid off their mortgage before the end of the examined time period, then they too will invest their remaining income after housing costs into the Finnish stock market. In this case, their investable income will be equal to th e money they save on their mortgage principal payment (which they do not have to pay anymore after the mortgage is paid off), as defined in equation 8 in the term $IS_{o,m,t}$.

Now that we have defined the model that we will be using to find answers to our research problem, we can move on to a description of the data collection and preparation process that was conducted to collect and prepare the empirical data required in this study.

3.1.2 Data collection and preparation

This chapter contains a description of what type of data was collected for this study, where the data was collected from, and how it was preprocessed to prepare it for use in analysis. The results of this analysis are presented later in this study.

The collected data was used to acquire or estimate values for the variables present in the model shown in equations 8 and 9. For the purpose of being able to apply said model to a number of different location-dependent scenarios, certain data were collected for different locations or areas in Finland, with these locations being Helsinki, Lappeenranta and Kainuu. These locations were chosen for their different characteristics: Helsinki, the capital of Finland, represents the situation in a large Finnish city, while Lappeenranta represents a medium-sized Finnish city, and Kainuu represents a more sparsely populated region with a decreasing and an ageing population. This type of data can be referred to as area-specific data, while other data used in the study are not area-specific, as the values of non-area-specific data are not tied to any physical location. Additionally, all data was collected or estimated for the time period between 1.1.2000-31.12.2020, as this period covers all the different time periods that were analyzed in this study. Furthermore, it should be noted that all real estate related data, such as data about rents, were gathered from apartment buildings and row houses (Finnish: *rivitalo*), and therefore other types of buildings, such as single-family houses, have been left out.

The area-specific data that was collected starts with home price indices (calculated from prices per square meter) for the years 2000-2020, with the year 2000 being the base year of the index. Monetary values for home prices per square meter were obtained for the year 2019, and based on these values and the price indices collected earlier, home prices per square meter were calculated for all other years included in the study's examined time period. For Kainuu, it should be noted that monetary values for home prices were not available directly for the entire area, and they were estimated for the year 2019 based on prices per square meter in certain municipalities of Kainuu (Kajaani, Kuhmo, Puolanka, Sotkamo and Suomussalmi), which were further adjusted by weighing the prices per square meter in these municipalities by the populations of said municipalities to calculate an estimate for prices per square meter in the entire area of Kainuu for the year 2019. The data source used to obtain the data mentioned in this paragraph was a database owned by Statistics Finland.

Maintenance costs of a home (paid by the homeowner), another area-specific set of data, were collected per year per square meter from a Statistics Finland database for the years 2009-2019. After this, the share of maintenance costs relative to prices per square meter for the years 2009-2019 were calculated. These relative values were then used to estimate maintenance costs per square meter for the years 2000-2008 and 2020 by multiplying the prices per square meter for these years with the relative share of

maintenance costs compared to prices per square meter in 2009-2019. It should be noted that the exact values of home maintenance costs per square meter for Helsinki, Lappeenranta and Kainuu were not available in the Statistics Finland database that was used for this study. Instead, values for Helsinki were based on the entire Finnish capital region (includes also Espoo and Vantaa), while the values of Lappeenranta were based on all of southern Finland (includes multiple provinces in southern Finland), and the values for Kainuu were based on eastern Finland in general (includes other provinces outside of Kainuu as well). Therefore, maintenance cost values used in the study are at best an approximation of reality.

The data for rents per square meter for Kainuu and Lappeenranta were only available directly for the years 2015-2020, while for Helsinki this data was found directly for the entire period of 2000-2020. For Kainuu, rents per square meter in 2009-2014 were based on rents in Kajaani during these years, while rents for 2004-2007 were based on the average rents of Finnish municipalities with populations between 20000-59999 residents during these years. Rents used for Lappeenranta in 2004-2007 and 2009-2014 were based on average rents in all Finnish municipalities of similar population size during these years. As a final note, rents per year for both Kainuu and Lappeenranta for the years 2000-2003 and 2008 were estimated based on the average rent change rate per year in these locations during the time period 2004-2020. The data sources used for rents were Statistics Finland databases, as well as a report by the information center of the city of Helsinki, which included information about the city's rents during the years 2000-2012.

The last piece of area-specific data that was required were the transfer costs paid by the homeowner when selling their home. This data was poorly available, and data on real estate agent fees in Kajaani, Helsinki and Lappeenranta in 2013 were used to estimate the transfer costs. The information was obtained from a news article by Taloussanomat, written in 2013. In this setting, real estate agent fees in Kajaani were used as a basis for the transfer costs in all of Kainuu.

In terms of non-area-specific data, the first set of collected information included mortgage interest rates from Finland for the years 2000-2020, i.e. the study period. This information was directly available only for the years 2003-2020, and mortgage rates for the years 2000-2002 were estimated based on the 12-month Euribor interest rates for these years, which were incremented be adding a 0.7% margin (a typical bank margin rate for mortgages in Finland) on top of the Euribor 12-month rate. The source used to obtain

mortgage interest rates for 2003-2020 was the Bank of Finland, while Euribor interest rates for 2000-2002 were collected from the website Euribor-rates.eu.

Stock market returns from the Finnish stock market, another set of data not tied to an individual's living location, were calculated based on a dataset downloaded from the website Investing.com. This dataset required effectively no preprocessing at all, and it contained the monthly opening and closing values of the OMXHCAPPI index, a weight-capped stock market index that tracks the Helsinki stock exchange and includes all the shares listed on the exchange. Another dataset downloaded from Investing.com were the interest rates (yields) of the German 10-year government bond. This dataset was required for the risk analysis presented later in chapter 3.2.

The final information collected for this study from external sources were the wealth transfer tax and capital gain tax rates, which were both collected for the year 2020, and obtained from the tax administration of Finland. Although these tax rates have evolved over the years, they were only required for the year 2020, as this is the year where all of the time periods examined in this study end (all of the examined time periods take place within the timeframe of 2000-2020), and using current wealth transfer tax rates increases the future validity of the study's results.

3.1.3 Scenario analysis

In this chapter, we will be presenting our empirical analysis that will attempt to shed light to the question of whether one should have bought or rented their home in Finland in different situations. In other words, we will be applying our model, as presented in equations 8 and 9, to certain real-life scenarios based on collected historical data. Our objective is therefore to use our model and existing data from the past to determine whether renting or buying would have been the superior choice in certain historical scenarios. The results of this analysis, as well as our model in general may then be used as a guideline and a framework for future decisions regarding the matter.

Before the results of the analysis are presented, we need to first lay down the assumptions that were taken before the analysis was done. For the results to applicable to a real-life situation, the same assumptions would likely have to be taken.

The analysis was done from the viewpoint of an individual or a household that has the possibility to either rent or buy a home in Finland, with the assumption that the subject

will invest any leftover income after housing costs into the Finnish stock market. In this setting, leftover income for the renter is defined as the cost of living in an owner-occupied home, from which the cost of renting has been subtracted (the renter essentially saves the costs of owner-occupied living, but has to pay rent on their home), as defined in equation 9 in the term $IS_{r,m,t}$. It is assumed that if the individual chooses to buy a home, the home will be sold at the end of the examined time period, and if they choose to rent, any stock investments that they will have accumulated during the examined time period will be sold at the end of said time period. Furthermore, we will be assuming that buying a home will require the buyer to take on a mortgage, the initial balance of which will be equal to 90% of the purchase value of the bought home. Therefore, a 10% down payment is assumed for the homebuyer. The monthly mortgage payment will be calculated based on the assumption that the mortgage is an annuity loan (a very common loan type for mortgages in Finland), and the length of the mortgage will always be 11 years. As mentioned before in the thesis, if the mortgage is paid off entirely before the end of the examined time period, then the homeowner too will invest their remaining income after housing costs into the stock market, with these investments sold at the end of the examined time period. Finally, the initial purchase value of the home as well as monthly rents will be calculated based on the obtained home prices and rents per square meter, respectively, with the assumption that the size of the home is 80m2, as the average size of a home in Finland in 2017 was 79,8m2 (Statistics Finland 2018).

As the answer to the question of whether one should have bought or rented their home depends on a number of factors, it is necessary to conduct the analysis in multiple different scenarios to take into account the fact that different circumstances may change the balance between which tenure choice is the financially superior one. As previously mentioned, the analysis was conducted for three different physical locations in Finland, with those locations being Helsinki, Lappeenranta and Kainuu. In addition to conducting the analysis for different locations, the analysis was also conducted separately for four different time periods, all of which took place during the timeframe of 2000-2020. More specifically, the time periods included in the analysis were 2015-2020, 2010-2020, 2005-2020 and 2000-2020.

A summary of the results of the analysis can be found in table 3 on the next page. The table shows the final values of the owner's portfolio (OP) and renter's portfolio (RP) in all of the analyzed situations, grouped by the analyzed location and time period.

Table 3. Final monetary values of the owner's portfolio (OP) and renter's portfolio (RP) in the analyzed scenarios.

			Time period			
			2000-2020	**2005-2020**	**2010-2020**	**2015-2020**
Location and portfolio type	Kainuu	OP	168,611.12 €	121,165.36 €	77,979.38 €	39,313.12 €
		RP	62,956.93 €	64,385.81 €	62,329.36 €	24,339.67 €
	Helsinki	OP	534,287.46 €	453,781.12 €	351,686.15 €	229,292.14 €
		RP	188,225.02 €	235,345.85 €	238,621.14 €	139,354.57 €
	Lappeenranta	OP	231,774.90 €	174,319.82 €	115,503.22 €	59,142.96 €
		RP	122,746.52 €	133,860.37 €	105,615.26 €	50,665.77 €

Looking at the numbers in table 3, we can see that the value of the owner's portfolio is greater than that of the renter's portfolio in each of the analyzed situations, regardless of the location or time period in question. This means that buying a home has been the superior choice in all of the analyzed situations, as defined by the principles presented in equation 7 earlier. An interesting finding is that the absolute values of the owner's and renter's portfolios have an almost linear dependency with the size of the home. As the numbers in table 3 were calculated with the assumption that the individual would be living in a home with a size of 80m2, each extra square meter in the home would increase the numbers in table 3 by roughly 1/80 of their current values. Additionally, it should be noted that the absolute values of OP and RP tend to be highest in Helsinki and lowest in Kainuu. This is because home prices and maintenance costs are the highest in Helsinki and lowest in Kainuu, leaving the owner and the renter with a higher (lower) monthly sum of money to invest in their home or the stock market. Therefore, the calculation comes with an in-built assumption that the individual's income is dependent of their living costs, which would likely not be fully the case in reality. Consequently, the absolute figures in table 3 might not be fully realistic in practice, but they do indicate which tenure choice (buying or renting) has been the better one in each scenario. Furthermore, it can be assumed that the absolute values of the figures in table 3 could be somewhat different if one could, for example, live in Kainuu with the same income level as someone living in Helsinki, although an examination like this is not included in the scope of this study.

For the purpose of easier interpretation, the results shown in table 3 are presented in visualized format in figures 14-17 on the next pages.

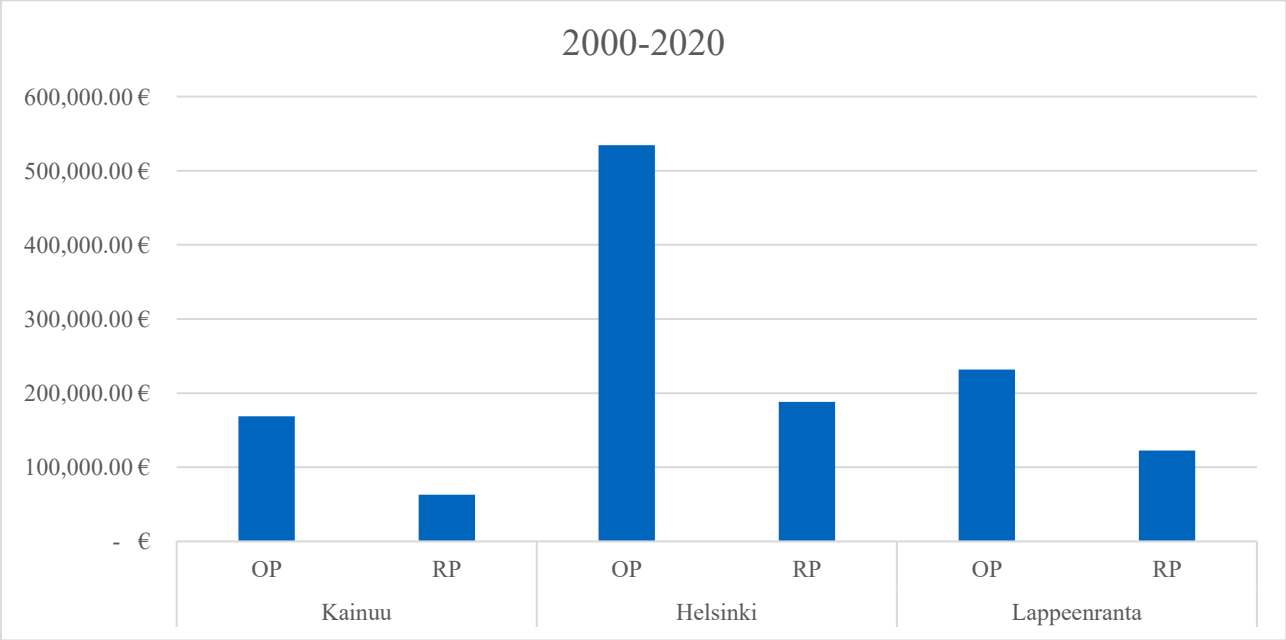

Figure 14. Final monetary values of the owner's portfolio (OP) and renter's portfolio (RP) for the time period 2000-2020

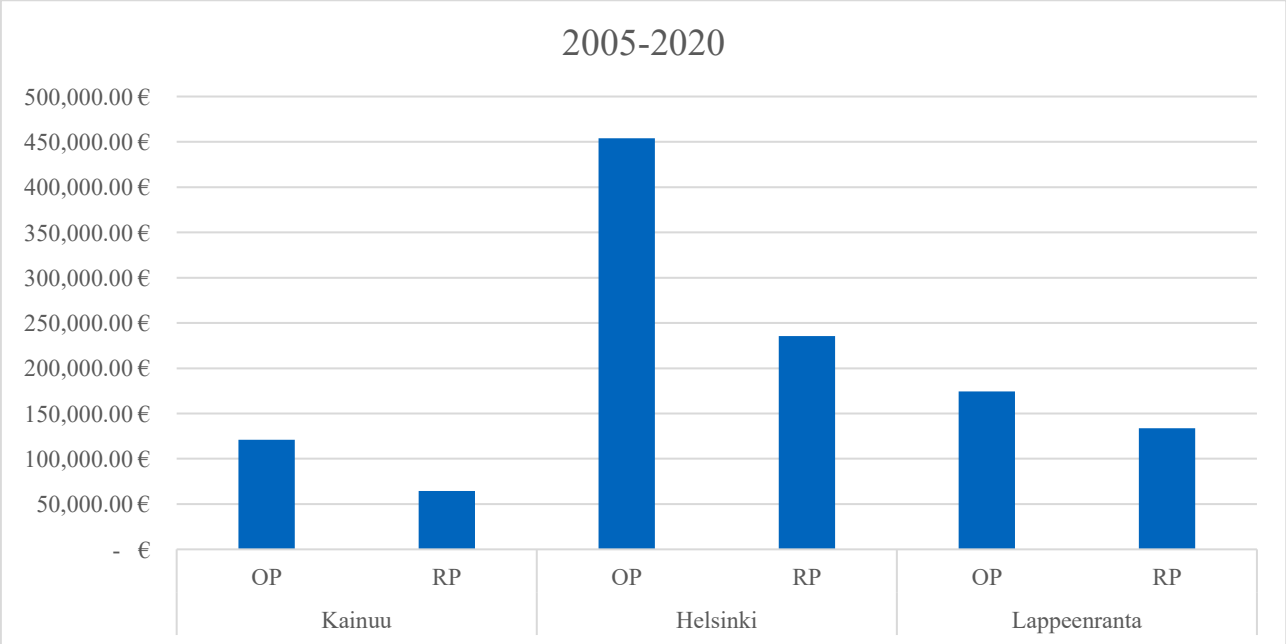

Figure 15. Final monetary values of the owner's portfolio (OP) and renter's portfolio (RP) for the time period 2005-2020

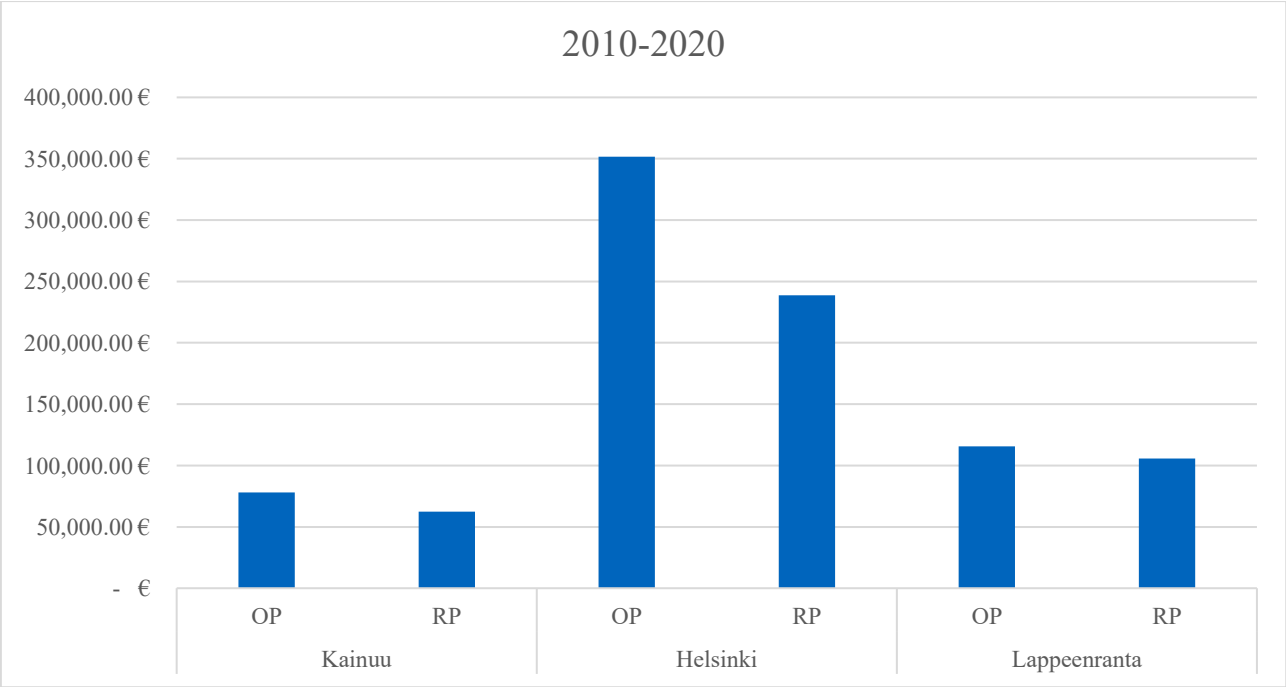

Figure 16. Final monetary values of the owner's portfolio (OP) and renter's portfolio (RP) for the time period 2010-2020

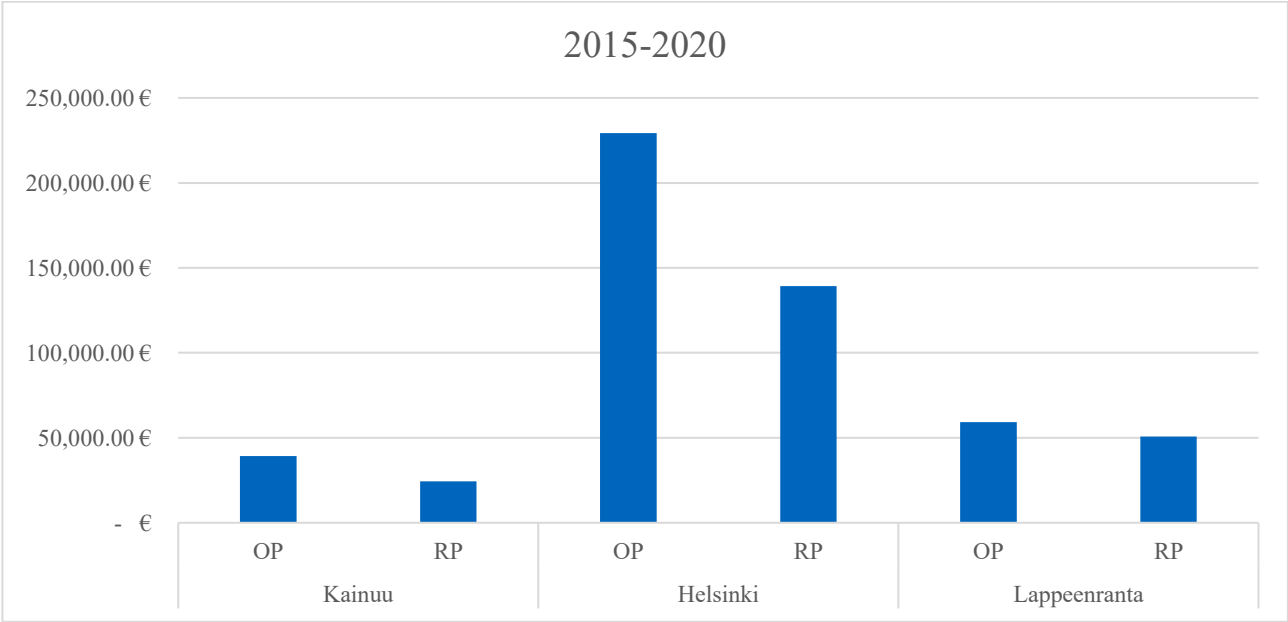

Figure 17. Final monetary values of the owner's portfolio (OP) and renter's portfolio (RP) for the time period 2015-2020

It is important to consider the reasons that have made renting a less desirable living option compared to owning in the situations that we have examined. Figure 18 shows the

developments in maintenance costs of owned homes during the years 2000-2020 in the examined locations. We can see that maintenance costs have mostly been following an uptrend, especially in Helsinki, which has increased homeowners' living costs. While this has at least seemingly increased the attractiveness of renting compared to owning a home, the effect has been at least partially offset by the fall in total mortgage payments (principal + interest), as seen in figure 19, which has been caused by the decrease in interest rates since the end of the 2008-2009 financial crisis (see figure 9). However, for an 11-year mortgage taken in the beginning of the year 2000, almost half of the timescale in figure 19 would be time when the mortgage has actually already been paid off in full. During this time, the owner would be able to invest their surplus income into the stock market, with the owner's living costs being comprised only of the home's maintenance costs, which are almost always lower than rent for a similar home. Combined with the low interest rates in the 2010s, these factors have made owning an attractive method of living.

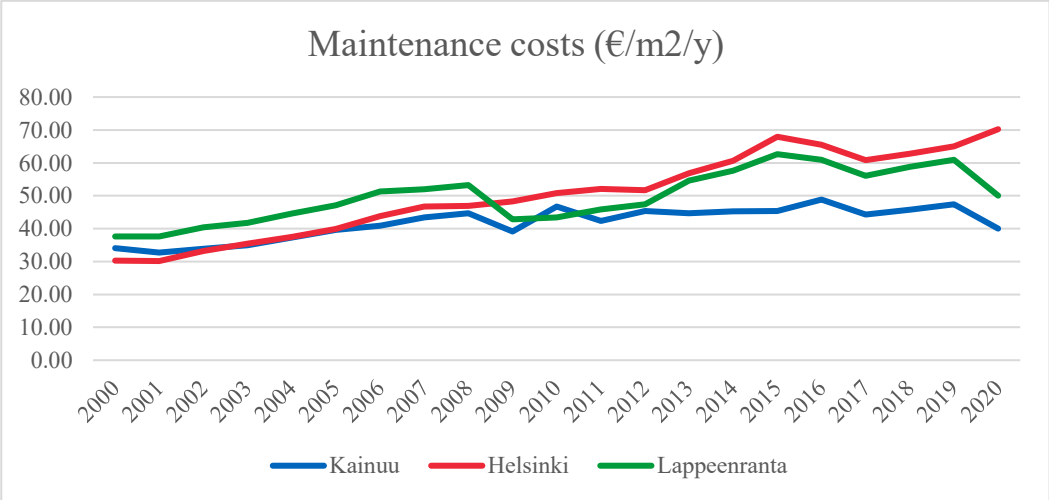

Figure 18. Average maintenance costs of owned homes during the years 2000-2020

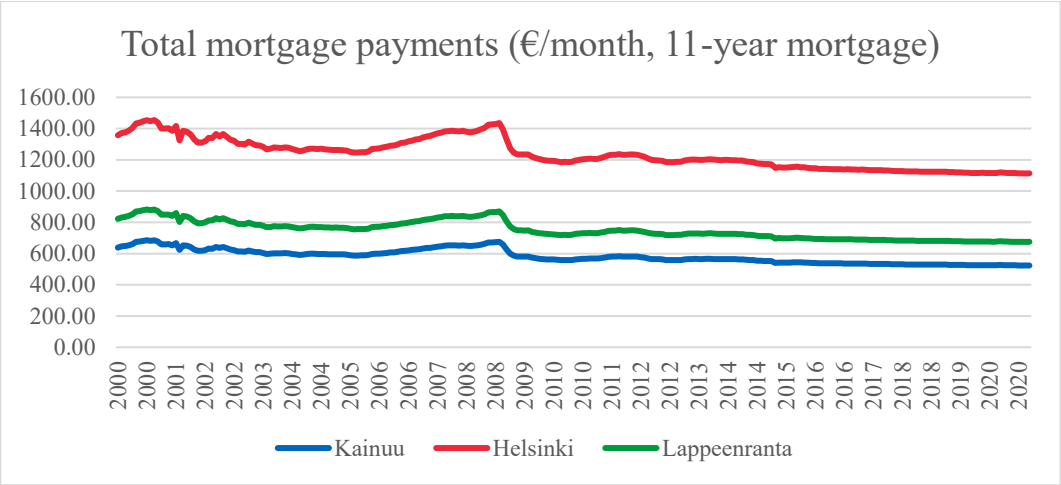

Figure 19. Total mortgage payments for an 11-year mortgage for a home with a size of 80m2, with the payments started on 1.1.2000. After the mortgage is paid off, the payments can be invested into the stock market instead.

While mortgage costs for homeowners have been in a downtrend since 2008, rents in the examined locations have been rising quite steadily during the entire 21st century, as seen in figure 20 below. This has meant that renters would have been left with a decreasing amount of money to invest per month, weakening their ability to build a portfolio of stocks for themselves.

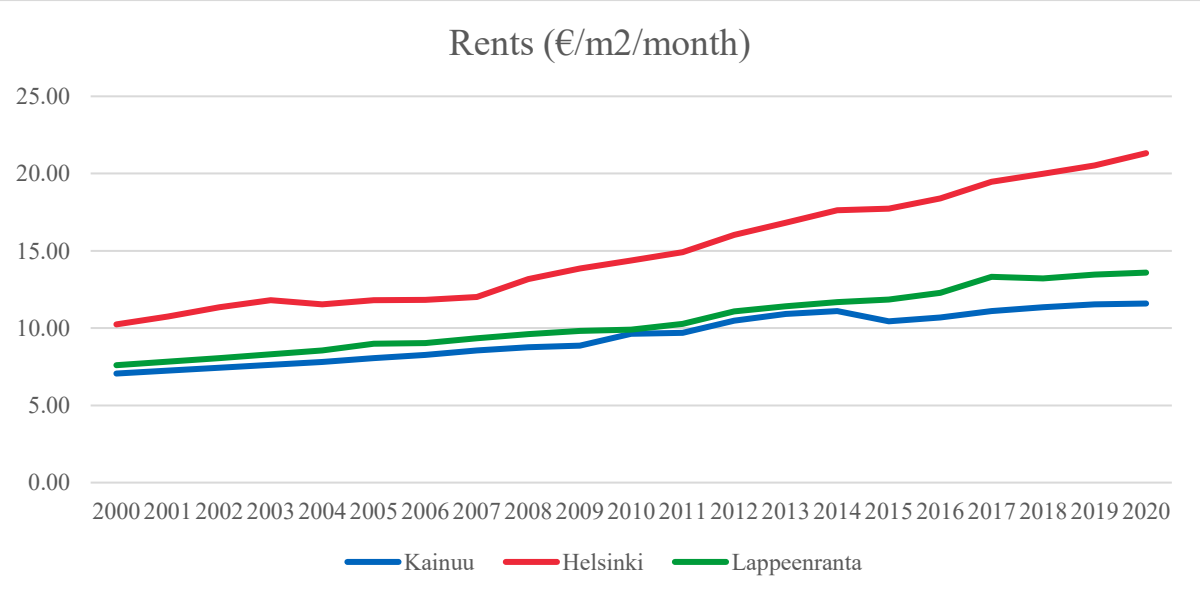

Figure 20. Average rents per square meter in the examined locations in 2000-2020

We have now established that the primary reasons for owning being the financially superior method of living in the analyzed scenarios are the fall in interest rates after the financial crisis, the constant rise in rents during the 21st century, as well as the drop that

occurs in the owner's living costs once their mortgage is fully paid off. However, looking at the numbers in table 3, we can see that the monetary differences in the values of the owner's and renter's portfolios are smaller when the examined time period is shorter. This result would suggest that renting does become a more viable tenure choice over shorter periods of time, as identified already in some previous studies, such as in Shelton's (1968) study. While the one-time costs of buying and selling a home, such as wealth transfer taxes and transfer costs of selling the home contribute to this, there were also other factors at play during the time periods examined in our study.

Figure 21 shows the trend in home prices in the examined locations after the year 2000. From this graph, we can see that home prices have risen strongly in Helsinki, while prices have mostly stagnated and risen only slightly in Kainuu and Lappeenranta during the past 20 years. However, the Finnish stock market has yielded fairly low returns in the time period of 2000-2020, as can be seen from figure 22 and table 4. These low returns are a direct consequence of the bursting of the dot-com bubble in early 2000, as well as the financial crisis of 2008-2009, which both affected the stock market in a negative way. Overall, the low returns from stocks were a key reason for the large difference between the renter's and owner's portfolios for the period of 2000-2020.

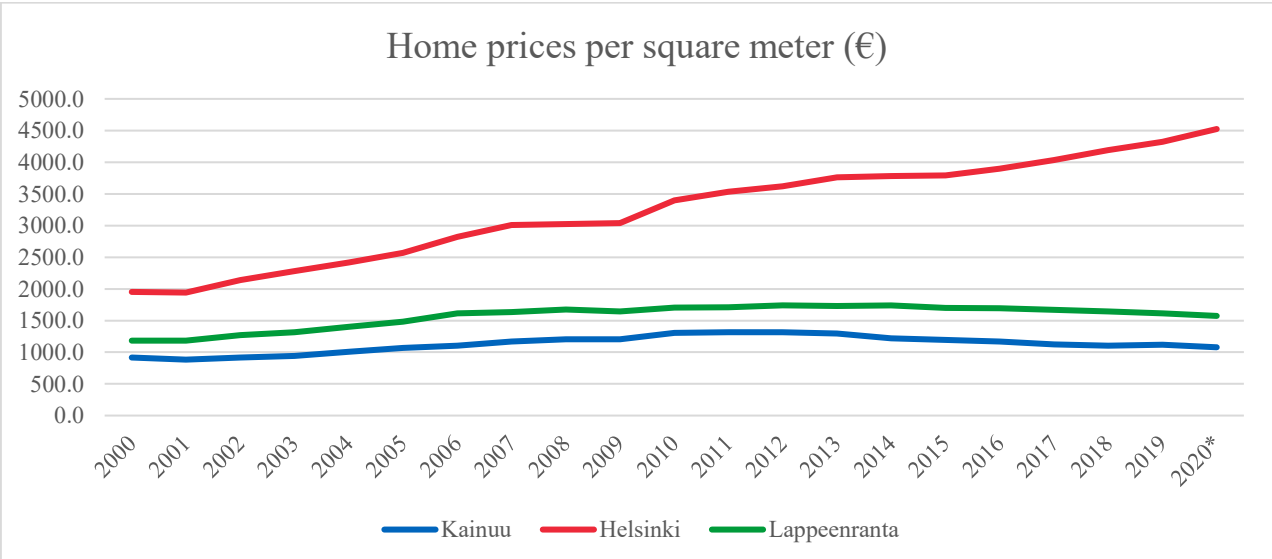

Figure 21. Home prices per square meter in 2000-2020. The year 2020 is marked with an asterix (*), as it is based on a forecast

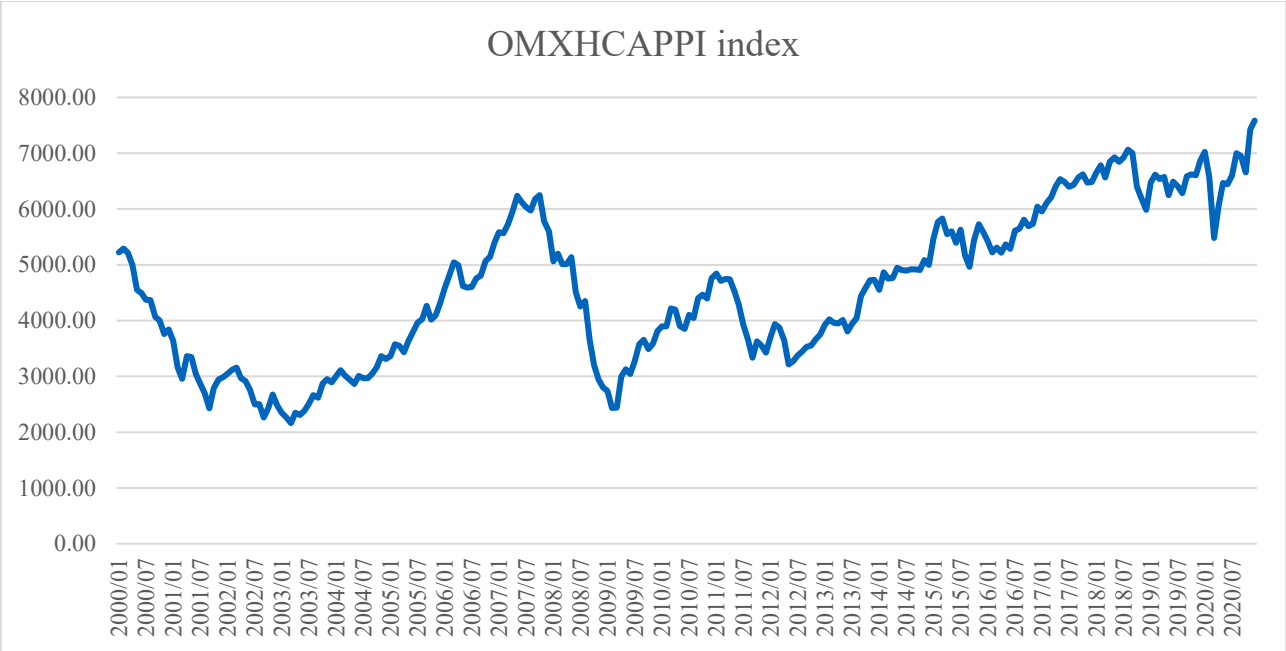

Figure 22. OMXHCAPPI index during the examined time periods

Table 4. Average annual returns from the Helsinki stock exchange.

	2000-2020	2005-2020	2010-2020	2015-2020
Average annual returns from the stock market (%)	1.88%	5.57%	6.89%	6.79%

For the other examined periods, such as 2005-2020, we can see from table 4 above that the overall returns from stocks for these time periods have been much more attractive than for 2000-2020, which has decreased the difference between the owner's and renter's portfolio values. Additionally, it must be noted that for the time periods of 2010-2020 and 2015-2020, the homeowner's mortgage was not fully paid off during these periods (as the mortgage length was 11 years), so the owner was not able to invest in the stock market like the renter was. This also contributed to smaller differences in the values of the owner's and renter's portfolios during the shorter time periods included in the study, especially when considering that homes in Lappeenranta and Kainuu have only lost some of their value since 2012, leaving the homeowner with negative returns on their money invested in their home for this time.

Now that we have examined and compared the financial attractiveness of owning versus renting a home from the viewpoint of an individual who wishes to invest their remaining income after housing costs into the stock market, we can move on to examine the riskiness of the different options in the setting of our study.

3.2 Risk analysis

In this chapter, we will be conducting a risk analysis on the situation examined in our study. The analysis is done in an attempt to find answers to our third research question, which focuses on the problem of whether it has been riskier to buy or rent one's home when leftover income after housing costs has been invested into the stock market.

The analysis will be conducted from a purely mathematical and financial viewpoint, like the scenario analysis conducted in the previous chapter, as that is the viewpoint that we have assumed in this study. This means that we will be ignoring all other possible risks and ways of measuring them that may be attached to the problem of buying vs renting a home, and will focus only on the monetary risks attached to the situation.

As explained previously in chapter 2.2.3, volatility (i.e. price fluctuation) is commonly used to measure and compare the riskiness of different assets. It is commonly accepted that stock markets tend to be more volatile and therefore riskier than the real estate market, and this assumption is confirmed to be true for the Helsinki stock exchange and the real estate markets (or homes-for-sale markets) of Helsinki, Kainuu and Lappeenranta for our examined time periods in tables 5 and 6. These tables showcase the percentual standard deviation of prices in the Helsinki stock exchange (table 5) during our examined time periods, versus the same metric for home prices in Helsinki, Kainuu and Lappeenranta (table 6). The figures were calculated by calculating the standard deviations of prices during each time period, and dividing them with the average prices for the same periods. Due to this, longer time periods tend to experience higher levels of volatility, as the prices have more time to fluctuate and to grow or decrease further away from the mean.

Table 5. Percentual standard deviations of stock prices in the Helsinki stock exchange.

	2000-2020	2005-2020	2010-2020	2015-2020
Standard deviation of stock prices (%)	29.76%	23.89%	21.92%	9.57%

Table 6. Percentual standard deviations of home prices in Kainuu, Helsinki and Lappeenranta.

Standard deviations of home prices (%)	2000-2020	2005-2020	2010-2020	2015-2020
Kainuu	11.64%	6.91%	7.22%	4.10%
Helsinki	24.13%	15.30%	8.40%	6.38%
Lappeenranta	11.49%	3.96%	3.02%	3.14%

As we can see from tables 5 and 6 above, stock prices have experienced more volatility than home prices during each of the included time periods. Unsurprisingly, this hints that renting a home and investing in stocks is generally riskier than buying a home and simply paying off the mortgage of said home thereafter (i.e. investing money in one's own home).

However, a simple examination of volatility does not give us a robust enough image of the situation. For this reason, we will apply two other risk metrics as well to get a better view of the riskiness of the different options. More specifically, these risk metrics will be the Sharpe ratio and Value at Risk (VaR ratio).

The Sharpe ratio is a risk measure originally developed by William F. Sharpe, and it is used to measure the returns of an investment compared to its risk. More specifically, the Sharpe ratio takes the rate of return of an investment (R_p) that is in excess of the risk-free rate of return (R_f) and compares it to the volatility of the investment in question (σ_p), as shown in equation 10 (Fernando 2020). A higher value therefore indicates a better risk-adjusted return that is in excess of the risk-free rate of return. Values over 1.00 are generally considered to be "good", while values under this level are not considered to be very good. Negative values indicate that the investment has in fact yielded worse returns on average than a risk-free investment would have. (Fernando 2020)

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p} \tag{10}$$

The Value at Risk (VaR ratio) is a statistical risk metric that quantifies the probability and magnitude of a potential loss within a certain timeframe. For example, an asset with a 5% annual VaR of 10% would have a 5% chance of declining in value by 10% or more during any given year. It should be noted that VaR only measures the probability of a certain or greater loss occurring within a certain timeframe, meaning a 50% annual loss, for example, would still be included inside the 5% probability range in the above

example. Therefore, VaR does not give indication of the absolute maximum potential loss during a certain time period, but rather an estimate of probability for a certain or greater loss occurring during said time period. (Kenton 2019)

The Sharpe ratio was used to examine whether the renter's stock investments would have yielded better risk-adjusted returns than the homeowner's investment in their own home in our examined situation. The VaR ratio, on the other hand, allowed us to assess the potential annual losses that could have occurred from investments in the Helsinki stock exchange, or from home purchases in Kainuu, Helsinki and Lappeenranta with a certain probability during our examined time periods.

When calculating Sharpe ratios for the Helsinki stock exchange, the average annualized returns were calculated for monthly investments placed in the OMXHCAPPI index for each month included in the examined time periods, with the assumption that the investments were sold at the end of the year 2020. These returns rates were then compared with the annual interest yield of the German 10-year government bond, which acted as the risk-free return rate in our calculations, and the calculation result was divided by the standard deviation of these returns that were in excess of the risk-free return rate. For homes purchased in Helsinki, Kainuu and Lappeenranta, the Sharpe ratios were calculated similarly by subtracting the risk-free return rates from returns that would have been earned by homeowners via home price appreciation in these examined locations, and then comparing these results with the standard deviations of the excess returns from homeownership.

Value at Risk, or VaR, was calculated for the Helsinki stock exchange and owned homes in the included locations with a 5% annual probability of loss occurring, with the magnitude of the potential loss equal to or greater than the VaR. Therefore, the results can also be called VaR(5%) for short.

Tables 7-10 below show the results of the analysis, i.e. the Sharpe ratios and VaR(5%) for the examined time periods and locations.

Table 7. Sharpe ratios for the Helsinki stock exchange.

	2000-2020	2005-2020	2010-2020	2015-2020
Stock market Sharpe ratios for the Helsinki stock exchange	0.49	0.57	0.71	0.72

Table 8. Sharpe ratios of owner-occupied homes in the examined locations.

Sharpe ratios of owner-occupied homes	2000-2020	2005-2020	2010-2020	2015-2020
Kainuu	-1.28	-1.20	-1.86	-1.89
Helsinki	1.07	1.18	1.25	2.63
Lappeenranta	-0.99	-1.22	-1.65	-1.56

Table 9. Annual VaR(5%) for the Helsinki stock exchange.

	2000-2020	2005-2020	2010-2020	2015-2020
Stock market annual VaR(5%) for the Helsinki stock exchange	-30.77%	-26.91%	-15.76%	-4.40%

Table 10. Annual VaR(5%) of homes in the examined locations.

Home prices annual VaR(5%)	2000-2020	2005-2020	2010-2020	2015-2020
Kainuu	-5.45%	-5.80%	-6.68%	-4.47%
Helsinki	-1.51%	-1.20%	-1.02%	0.80%
Lappeenranta	-4.01%	-4.27%	-3.30%	-2.78%

Starting with the Sharpe ratios in tables 7 and 8, we can see that this metric is positive for the Helsinki stock exchange for all our examined time periods, meaning that stock investments in the Helsinki stock exchange yielded, on average, better returns than a risk-free investment would have. However, all of the values in table 7 are clearly below the threshold of 1.0, so the risk-adjusted returns from stocks have not been very good despite beating out the nominal risk-free return rate.

Table 8 gives us interesting insights about the financial attractiveness of homeownership in the examined locations, especially when compared with the Sharpe ratios of stocks in table 7. Homes in Kainuu and Lappeenranta have had negative Sharpe ratios, meaning homeowners have made less profit via homeownership than they would have via a risk-free investment. This is unsurprising, given the negative trends that have been in place in home prices in these locations since 2012. Homes in Helsinki, however, have had positive Sharpe ratios for all of the examined periods, and most notably in 2015-2020, the Sharpe ratio for owned homes in Helsinki was 2.63, which can be interpreted as a very good result. In fact, homes in Helsinki have yielded significantly better risk-adjusted returns than stocks when measured by the Sharpe ratio during all of the examined timeframes.

Tables 9 and 10 further confirm the riskiness of stock investments as opposed to homeownership, which was already seen by examining standard deviations in tables 5 and 6. Table 9 shows that stock investments in the Helsinki stock exchange had an at least 5% chance of declining significantly on an annual basis when the examined timeframe was long enough, such as during the time period of 2000-2020. The potential annual losses that the renter could have suffered through their stock investments with a 5% probability were significantly higher, for the most part, than the corresponding losses for the homeowner, as seen by comparing the figures in tables 9 and 10.

The risk analysis conducted in this chapter has shown that stock investments in the Helsinki stock exchange have mostly been significantly riskier than homeownership in the examined locations, especially over longer periods of time when measured by standard deviation and VaR(5%). This means that choosing renting and investing in stocks instead of buying a home has been the overall riskier option in most of the examined situations. However, an examination of the risk-adjusted returns of stocks vs homeownership revealed that stock investments have unsurprisingly yielded better risk-adjusted profits than owning a home in Kainuu or Lappeenranta, a direct result of the decreasing home values in these locations.

4 Conclusions

In this chapter, a summarization of the study's objectives and results will be presented, accompanied by a discussion of the implications of the results, as well as the limitations of the study. A brief note on potential future research topics around the topic of the thesis will also be included.

4.1 Summary and conclusions of the study

This study has examined the problem of whether buying or renting a home has been the financially better option in Finland when certain conditions have been assumed or known to be true. In particular, the problem has been examined from the viewpoint of an individual or a household that wishes to invest their remaining income after housing costs into the Helsinki stock exchange (i.e. the Finnish stock market), with the goal being to maximize their financial wealth over a certain time period.

A rigorous examination of past research on the topic was conducted to answer the first research question. Several studies were found to have examined the problem of buying versus renting a home (see e.g. Shelton 1968, Beracha et al. 2012). While these studies often approached the problem from different viewpoints, renting was commonly identified as the cheaper living option during shorter periods of time, while recent trends in the housing market in the United States had favored owning over renting. However, research on this topic in Finland seemed to be lacking, as most of the existing studies focused on the situation in the US.

Answering the second research question required us to construct a mathematical model that could be used to compare the financial attractiveness of renting versus owning a home in a situation where leftover income would be invested into the Finnish stock market. After building a set of equations for this purpose, real-life historical data was collected, and the model was applied to practice using this data. A comparison of three different living locations in Finland, which included Kainuu, Helsinki and Lappeenranta, and which were further split up between four different time periods, thereby making up a total of 12

different historical scenarios, showed that buying and owning a home had been the superior choice over renting in all of the examined situations. The main reasons for this were that while rents have been increasing in the examined locations fairly consistently for the entire 21st century, mortgage interest rates, and therefore the costs from having a mortgage, have been falling since the 2008-2009 financial crisis, thereby lowering the costs of owner-occupied living as opposed to renting. However, it was identified that the relative advantage owning had over renting was smaller over shorter time periods, a result that was consistent with previous research, such as Shelton's (1968) study. One-time costs of buying and selling a home, such as wealth transfer tax and transfer costs that occur when the home is sold, contributed to this result. The result therefore implies that buying an owning a home is the better option for households that do not plan to move anywhere in the next 5 or more years, at least in Helsinki, where home prices are rising. Conversely, renting may well be the better option over shorter periods of time, though it is unclear how short the tenure period would have to be for renting to become more favorable than owning.

For young adults looking to buy a home in Finland, the situation remains fairly difficult. Even though buying a home was identified as the superior tenure choice especially in Helsinki, a very popular living location for adults aged 18-29 in Finland, the rising home prices in Helsinki will likely not make it any easier for this age group to move towards owner-occupied housing. At the same time, it may be easier in terms of affordability to buy a home elsewhere in the country, however decreasing home values in many locations do not encourage this decision. For many young adults, this can mean being stuck in rental housing due to financial restrains, even though renting may not be the financially optimal choice in their living location.

When examining the third research question, it was clear that renting and investing in the stock market was riskier than homeownership when measured through volatility, a standard mathematical risk measure that measures the fluctuation in the price of an asset. This result was directly caused by the higher volatility in stock prices compared to home prices, as in our examined situation the renter via their stock investments is exposed to stock market volatility, while the homeowner is generally either not exposed to stocks at all, or if they are, their exposure should be relatively smaller than that of the renter's, whose entire portfolio was invested in stocks in the examined situation.

However, since a simple volatility examination cannot be considered sufficient to assess and compare the risks related to homeownership versus renting and investing in the

stock market, we used also other financial risk measures to find answers to our research question. These risk measures were the Sharpe ratio, as well as Value at Risk with an assumption of 5% probability of loss, or VaR(5%) for short. The Sharpe ratio was used to examine the risk-adjusted returns of investing in stocks versus purchasing and owning a home, while the VaR(5%) gave insights on the potential annual losses that the individual or household could suffer as a result of their stock investments or homeownership. The analysis that utilized the Sharpe ratio showed that risk-adjusted returns from stock investments in the Helsinki stock exchange were better than returns from homeownership in Kainuu and Lappeenranta, namely due to the falling home values in these locations. However, homeowners in Helsinki had enjoyed significantly better risk-adjusted returns from owning their home compared to investments in the Helsinki stock exchange. Finally, the results of the VaR(5%) calculations showed us that the value of stock investments in the Helsinki stock exchange could decline much more on an annual basis than the values of homes in the examined locations. Therefore, the VaR(5%) analysis strengthened the view of renting and investing in stocks as a much riskier choice over homeownership due to the significant losses that could occur on a yearly basis as a result of exposure to the stock market.

To summarize the risk analysis conducted as part of this study, traditional risk measures such as volatility (measured here through standard deviation) and VaR depict stocks as a much riskier asset class compared to homes, thereby making renting and investing in stocks the riskier choice over buying and owning a home. However, in locations where home prices are falling, such as Kainuu and Lappeenranta, buying a home likely means that the individual or household will lose money over time. Therefore, buying a home in these types of locations may not be the most financially viable choice despite being at least seemingly less risky than renting and investing in stocks.

4.2 Limitations of the study

Although the study produced insightful results that may aid in the decision-making of households looking to choose between renting and buying a home in Finland, there were some significant limitations to the study that must be accounted for when interpreting the study's results and before using them in any real-life decision-making situation.

Firstly, the study only considered the financial aspects related to owning and renting a home and investing in the stock market. Therefore, the study and its results are only able to give financial guidelines on how to choose between renting and owning a home. Other factors possibly impacting this decision, such as household needs, life situation, psychological factors and ease of living, were not considered. This approach assumes an economically rational individual that makes the decision of whether to own or rent a home simply based on mathematical and economic facts or circumstances. In reality, this assumption is likely not to be true, and other factors outside financial ones would have to be considered before making any choices on the matter.

Secondly, the scenario analysis conducted in chapter 3.1.3 was done based on historical data, and the future validity of the results therefore depends entirely on past trends continuing in the future as well. It is known that returns from the stock market may fluctuate significantly from time to time, especially over shorter time periods, and past trends in home prices and interest rates, for instance, may not necessarily continue in the future. In addition to this, some of the data used in the analysis was not directly available and was instead estimated or extrapolated based on available data, and finally, the analysis was conducted only for a limited number of scenarios. For these reasons, the results from the scenario analysis in chapter 3.1.3 should not be used as exact advice on how to make any decision between buying or renting a home, but rather as guidelines and as an example of how to analyze this type of a decision.

Similar to the scenario analysis in chapter 3.1.3, the risk analysis presented in chapter 3.2 was also done based on past data, and therefore the continuation of past trends is a prerequisite for the future validity of the analysis and its results. The risk analysis that was done was also very limited in nature, as it included only a total of three different risk measures to compare the riskiness of investing in stocks versus buying a home. It is reasonable to assume that these three metrics do not accurately measure all of the financial risks involved in investing in stocks or buying a home, and therefore, the results of this analysis too should be used as more of a guideline framework rather than as exact advice on how to assess the risks involved in investing in the aforementioned asset classes.

4.3 Further research

Several relevant future research topics can be derived from this study. One rather obvious option would be to expand this study to include more time periods and locations in Finland, to be able to better generalize the results. Another option would be to conduct a study that would investigate the maximum length of the tenure period that would be allowed in order for renting to be the financially better tenure choice. This would give households better guidance on whether renting or buying a home is the better option in their specific situation. A third possibility would be to study the non-financial factors that go into the rent vs buy decision. Such a study could be conducted on a qualitative basis by way of interviews, for example, and together with this study, it could give households comprehensive guidance on which type of factors to take into account to make better choices in terms of their tenure choice.

Since the risk analysis conducted in this study was quite limited, a much more detailed and comprehensive risk analysis focused around the situation examined this study would give a better overall understanding of the risks involved. A risk analysis focused study could include many more risk measures and indicators beyond those that were used in this study, and it could also potentially examine the problem from a portfolio balancing perspective (i.e. how to maximize returns and control risks by making the correct tenure choices).

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